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APPLIED HYDRAULICS

JANUARY 1956

MACHINE DESIGN CIRCULATION

THE MAGAZINE OF FLUID POWER

FLUID POWER ENGINEERING INDEX

For information about
the APPLIED HYDRAULICS 1956 Prize Paper Contest
see page 133

This is it!

THE QUICK-CONNECTIVE PNEUMATIC COUPLING THAT GIVES YOU THESE BIG ADVANTAGES

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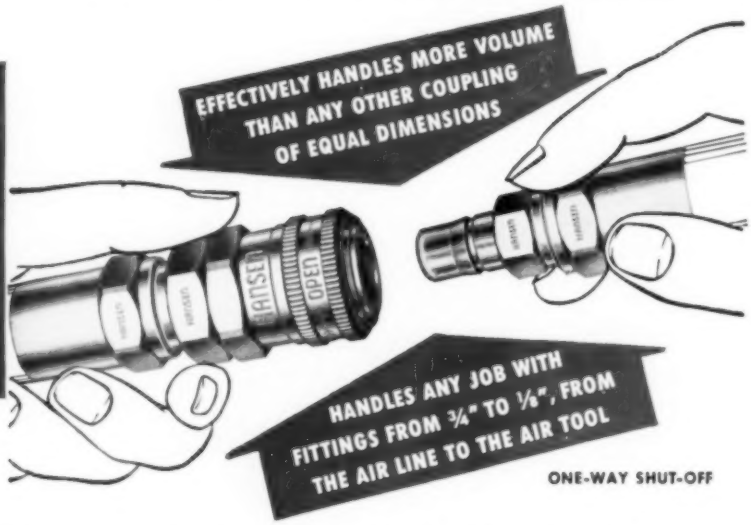
SERIES 3-RL
RING-LOCK COUPLING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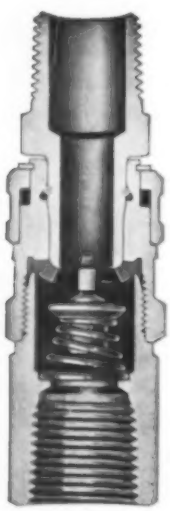

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- Equipped with automatic sleeve lock.

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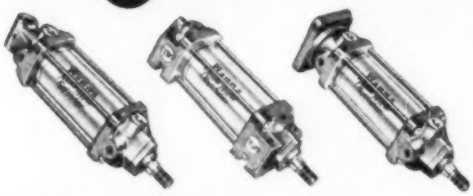
Hanna
FLUID T750 POWER CYLINDERS



The new Hanna T750 Series cylinders are the last word in smooth, dependable performance. These rugged, compact cylinders are built for air operation to 250 p.s.i. and oil or water operation to 750 p.s.i. Many mounting styles and interchangeable heads make these cylinders exceptionally versatile. Available in 1½", 2", 2½" and 3" diameters.

WRITE FOR CATALOG 750A

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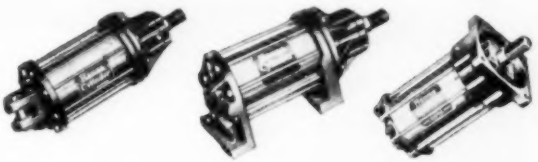
AIR & HYDRAULIC CYLINDERS



For low pressure air and hydraulic operation. Thousands of varied applications have proved the quality and reliability of these Hanna cylinders. Bore sizes range from 4" to 14". These cylinders, combined with Hanna T750 Series cylinders, offer a complete range of cylinder sizes and mounting styles. Made in any practical stroke length.

WRITE FOR CATALOG 236B

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WRITE FOR CATALOG 254

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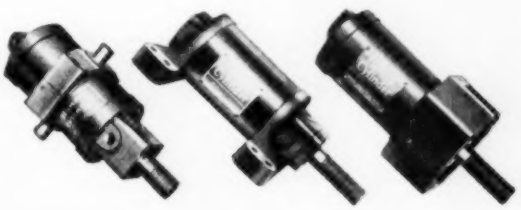
Hanna HP
HYDRAULIC CYLINDERS



Hanna HP cylinders are without equal for strength, precision and power. For operating pressures up to 1500 p.s.i. Bore sizes range from 1½" to 8" in a complete selection of mounting styles. Heads are fastened directly to the cylinder tube, giving clean appearance.

WRITE FOR CATALOG 233B

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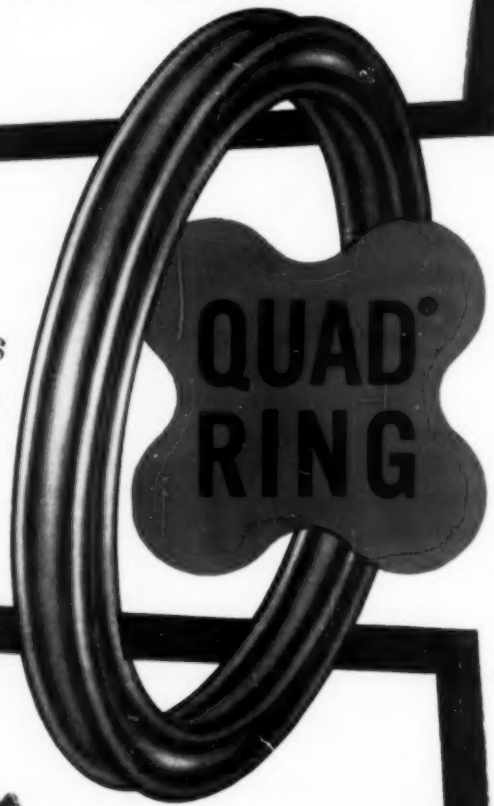

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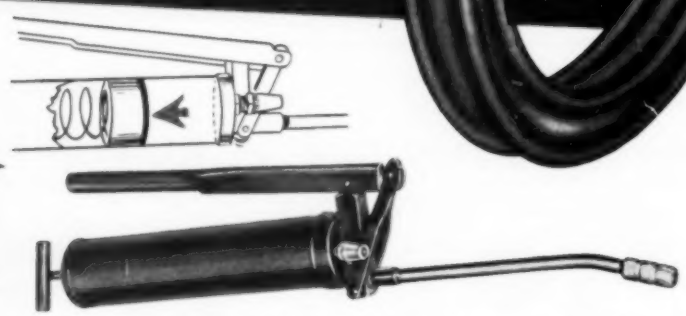

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APPLIED HYDRAULICS

THE MAGAZINE OF FLUID POWER

JANUARY 1956
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• ARTICLES • BOOKS • FILMS • REPORTS

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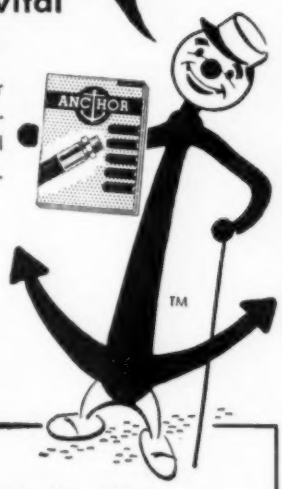

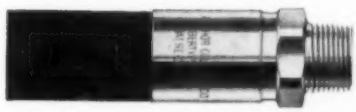

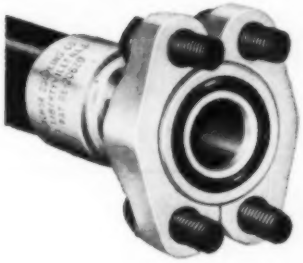

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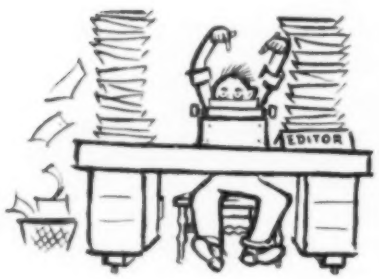
Fluid Power Lines

about Applied Hydraulics

Nothing reflects the growth of a field more than the literature written about it in periodicals and text books. Looking back over the past 25 years of published material in the fluid power field classified in this issue, we can view the progress made in this time. Much of it ties in with the political and economic picture of the time, and we are reminded of inflations, deflations, and wars we have been through.



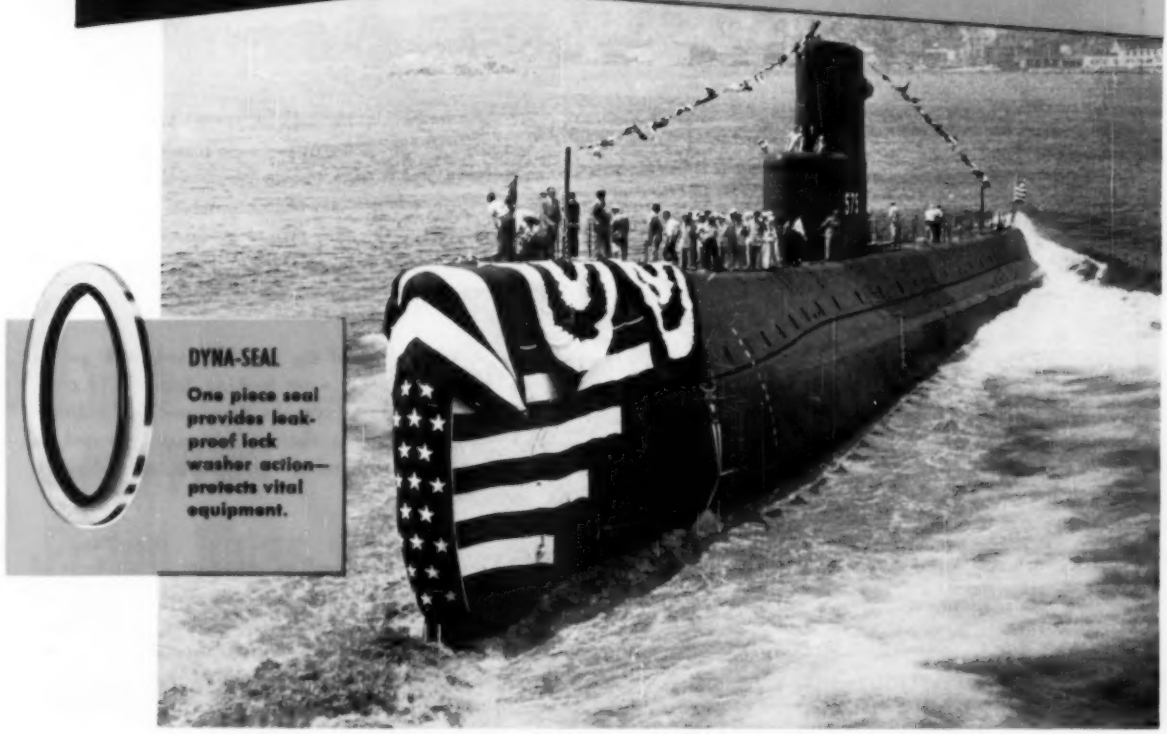
Back in the early 30's the economic picture was dark, radio was still in its infancy—television was a scientific fancy—and people in the machine tool industry were beginning to talk about the potential of hydraulics and pneumatics. In comparing hydraulic to mechanical feeds, the hydraulic advantages of flexibility, cushioned effect on tools, ease of control, safety factor, and lower power consumption were being recognized. Hydraulic motors were already in the picture, and though it wasn't called "automation," hydraulic and pneumatic equipment for loading and unloading individual machines was the subject of an article. In 1932, Walter Ernst presented his paper on the influence of oil compressibility on the speed characteristics of presses. German 10,000-ton forging presses were coming in for some attention in this country.

In 1932, prohibition was repealed and though we didn't notice any drastic effects on the development of fluid power, the field was certainly enjoying a healthy progress. New applications were being found for the excellent speed control characteristics of hydrostatic drives. Electrical controls began to woo fluid power, and the courtship was being talked about in the best of engineering circles. "Hydraulically Operated. But Electrically Controlled" is a typical title reporting this affair.

As the fields of plastics and die casting gained importance, fluid power tagged right along making possible the machines that today produce a great myriad of articles. In mobile equipment too, engineers were asking "What About Hydraulic Controls?" Tension and speed control in the continuous web process industries was another area to which fluid power brought its excellent speed control and synchronization characteristics. The circuitry of fluid power was growing too, and new components were being developed to meet the ever increasing demands and capabilities of air and oil systems.

That was only a few years before the great conflict into which fluid power put all its might. As America prepared her defenses, fluid power enlisted in the army and the navy, and quickly rose through the ranks. This was especially noticeable in aircraft applications. By 1943, aircraft hydraulics no longer meant a closed

Precision Dyna-seals seal the "eye" of the Seawolf



The use of Dyna-seals under bolt heads of the periscope mounting on the nuclear submarine Seawolf will provide positive sealing up to 10,000 P.S.I. Uncompromising requirements of the Precision Dyna-seal were controlled by rigid specifications.

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The valve-in-head ALLEN AIR Cylinder prevents this waste. This self-contained power unit, with its built-in valve, *eliminates* cumbersome hose or piping; a single hose is the only hook-up needed.

The air it saves is just *one* of the ways the ALLEN AIR Cylinder pays for itself . . . For pneumatic operation of equipment, the ALLEN AIR Cylinder gives the engineer a unit whose advantages add up to improved production, lowered costs. Its features include:

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2. Separate speed controls for advance and retract strokes; these controls are an integral part of the cylinder itself.
3. 4 bore sizes: 1⅛", 2", 3" and 4".
4. Single air inlet.

The electrically-operated model shown is just *one* of 8 different valve-in-head ALLEN AIR Cylinders that pay their way with the air they save.

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Fluid Power Lines

continued

system hand pump and receiver. There were aircraft applications in hydraulically powered turrets, gun chargers, engine controls, landing gear, control surfaces, and many other developments. The special requirements of this field were being recognized and met. Special packings and fluids were being developed. Problems of maintaining hydraulic systems under severe conditions were coming in for examination and were influencing the thinking of designers. The field of servomechanisms was developing, and an article by C. E. Grosser about hydraulic servo circuits appeared in 1942.

As early as 1944 there was talk of the trend toward 5000 psi in aircraft systems. Automotive engineers were looking forward to commercial applications of power steering systems developed for military vehicles. That fluid power had become a distinct field was indicated by the interest in developing standard symbols for hydraulic and pneumatic circuits.

In 1945, fluid power again turned its attention to products of peace, much the wiser for its wartime experience. Axis aircraft and manufacturing were examined and hydraulics was much in evidence. Industrial training courses for teaching apprentices were springing up. Electrical and fluid power systems were definitely alter-bound now; the gossip of their early competition had died out. Increasingly complex testing equipment was being developed, especially for aircraft systems. Equipment for acoustically detecting leaks in aircraft systems was described in 1947. 1948 saw the founding of APPLIED HYDRAULICS devoting its entire coverage to fluid power subjects and stimulating the interchange of information in this field.

"In the World of Tomorrow, Hydraulics will be at work in every corner of the globe"

Progress in this decade has been rapid: components, fluids, equipment applications all are making great strides. Electrical and fluid power systems are "old marrieds" now and proud of their children—electronics and servo valves. Whatever off-spring these produce, we can predict that the electrical-fluid power family will be a prodigious one. ▼▼▼

Checking the accuracy of fit inside of cylinder. Checker illustrates comparative size of the three 80-inch Koppers Piston Rings required per cylinder. Photo courtesy of S. Morgan Smith Co.

80-inch KOPPERS Piston Rings for McNary Dam Project

In all, 42 such rings will be incorporated in the McNary Dam installation equipment.

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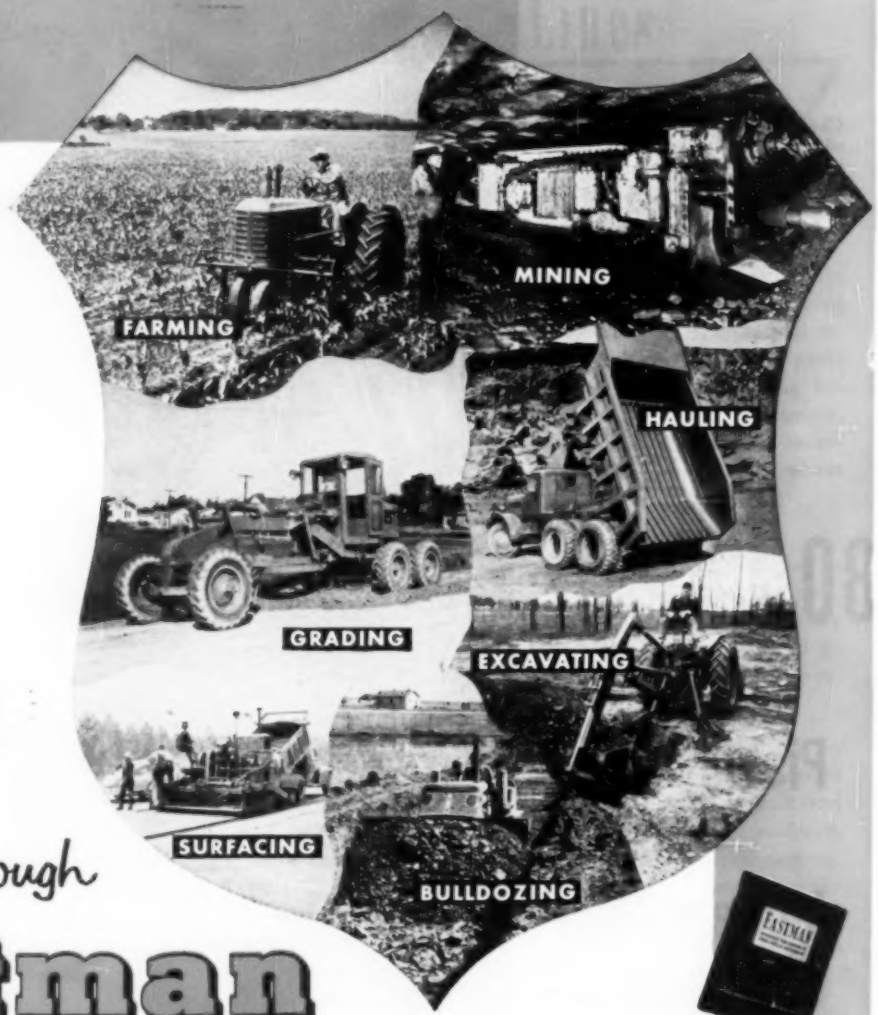

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EASTMAN — *first in the field* of Hydraulic Hose Assemblies—has had the privilege of *pioneering* in many original applications of hydraulic power — on equipment made by many of America's leading manufacturers — as shown in action in the industries, above.

Modern industry not only moves *hydraulically*, but with increased efficiency and economy—with improved production and performance . . . the kind of performance that improves your competitive position in your field.

If you have a power transmission problem, consult with Eastman Engineers. For improved performance due to many original exclusive Eastman designs . . . for quality of material and workmanship—always specify Eastman Hydraulic Hose Assemblies.

Eastman
first in the field
MANUFACTURING COMPANY
Dept. AH-1, Manitowoc, Wis.

FREE

WRITE for free Catalog 101 on Eastman Hose Assemblies.

LETTERS to the editor

DESIGN PROBLEM

We have been a constant reader of APPLIED HYDRAULICS for several years and have been able to solve many of our procurement problems through your fine advertisements and through the "Reader Service". However we now have a problem which we have been unable to solve. Is there an unloading valve which will operate under the following conditions:

> A small cylinder, 3 cc, will be charged over a period of 4 seconds with oxygen 45 psig. When this pressure is reached, the valve should open and "unload" until the pressure reaches the minimum as close to 0 psig as possible. This unloading operation should take place in as short a period of time as practical, preferably less than half a second. The valve should then close fully so that the cylinder may again be charged.

CARL H. HOLM
President
Old Dominion Research and Development Corporation
Brice, Virginia

We do not know of any standard valve which would open and close in response to pressure variation in the time you specify. Names of several manufacturers of hydraulically operated unloading valves who may be able to help have been sent to you. Have you considered doing this job with a solenoid operated shut-off valve which would operate in response to a pressure switch? This may be a practical solution.

WANTS A SERVO VALVE

We are contemplating a design of a hydraulic machine that would be controlled by servo type valves; however, we have encountered difficulty in finding manufacturers of the type of valve that will suit our purposes. The few manufacturers that we have contacted would have to make them special and we are hoping to get away from a specially built valve.

GOT A PUMPING PROBLEM?

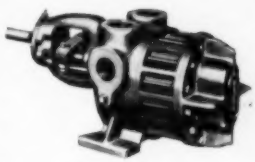
PERHAPS THE ANSWER YOU'RE LOOKING FOR IS A ROPER ROTARY PUMP

ROPER PUMP-MOTORS

These units offer low-speed and high-torque, and their versatility finds them well-suited to heavy-duty service within their operating range. In general, recommended speed is 200 to 800 R.P.M. with pressures to 800 P.S.I. In this range, they require from 7 to 40 G.P.M. flow and will develop up to 11.5 H.P. output at maximum speed and pressure.

ROPER SERIES F PUMPS

Among the dependable Ropers is the Series F Pump — pressures to 300 P.S.I., sizes 1 to 300 G.P.M. It features four-port design with 8 optional piping arrangements . . . supplied in standard fitted models. With packed box or mechanical seal; with or without relief valve.

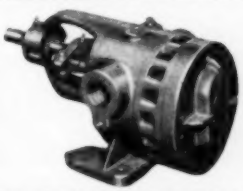


ROPER SERIES K PUMPS

Operate your hydraulic circuit with the correct size Roper for the particular job. In many cases the Series K will do, for it is rated from pressures to 150 P.S.I., capacities ¾ to 50 G.P.M. This model is compact, sturdy . . . is self-lubricated by liquid pumped. Comes with packed box or mechanical seal . . . with or without relief valve.

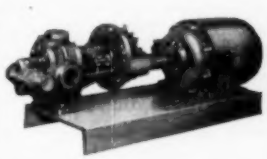
ROPER SERIES H PUMPS

Lower maintenance costs with a Roper. For instance, a pump like the Series H with pressures to 1000 P.S.I., sizes 10 to 75 G.P.M. is ideally suited for hydraulic mechanisms and for other applications requiring high pressures. Spur gears run in axial hydraulic balance . . . roller bearings and bronze wear plates reduce friction. Available with packed box or mechanical seal.



ROPER SERIES 3600 PUMPS

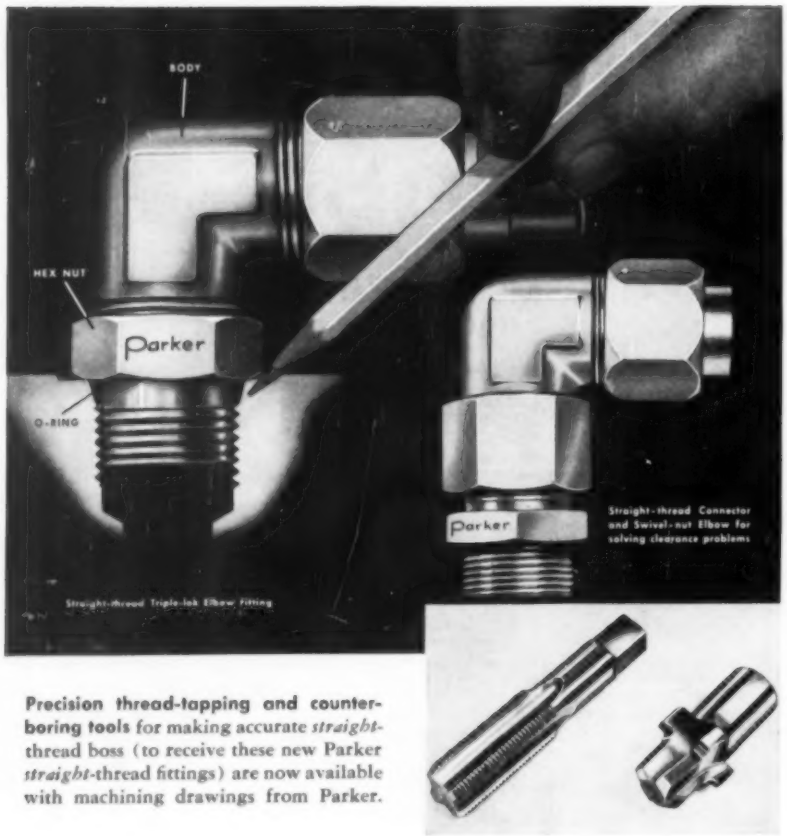
You'll profit more with dependable Roper Series 3600 Pumps on the job . . . they are speedy, quiet, and plenty rugged. Service-proved features such as self-lubrication, adjustable relief valve, hardened gears, and mechanical seal contribute to Roper dependability. Sizes range from 40 to 300 G.P.M.; pressures to 60 P.S.I.



GEO. D. ROPER CORP. 701 BLACKHAWK PARK AVE., ROCKFORD, ILL.

SEND NOW FOR DESCRIPTIVE BULLETINS

ROPER Rotary Pumps



Precision thread-tapping and counterboring tools for making accurate *straight*-thread boss (to receive these new Parker *straight*-thread fittings) are now available with machining drawings from Parker.

New Parker *straight*-thread fittings solve your leakage problems

Now you can forget about high-pressure hydraulic problems resulting from tapered pipe threads. Forget about leakage . . . about the danger of cracking or distorting valve bodies by over-tightening the fittings . . . about damaged threads from over-tightening to obtain proper positioning. Forget about messy pipe "dope".

You can eliminate all of these problems by using new Parker *straight*-thread fittings with positive O-ring seals. (See illustration above.)

Parker *straight*-thread fittings are now being supplied in response to the growing demand for this new type of leakproof, trouble-free connection. They are shorter and have smaller hexes than the AN fitting for the old AND 10050 boss. *Straight* threads are available on *Triple-lok* (the industrial standard flare tube fitting) and on *Ferulok* (flareless fitting for heavy steel tubing).

This is another example of Parker's pioneering leadership in the field of hydraulic fittings. Write for Cat. 4301.

TUBE AND HOSE FITTING DIVISION
Section 414-F
The Parker Appliance Company
17325 Euclid Ave., Cleveland 12, Ohio

Parker
Hydraulic and fluid system components

LETTERS to the editor

Can you send us a list of manufacturers that produce a servo type valve (duplicating control)?

The valves that we have found work under very light pressure since most of them use a follower contacting a rather delicate form. We are primarily interested in a control that could be used on a cam that could stand a 40 to 60 pound pressure. This would give us a more accurate control.

VICTOR J. MONTOYA
Chief Engineer
W. A. Stevens Company
P. O. Box 1269
Athens, Georgia

We've sent you a list of manufacturers of hydraulic servo valves. We don't know whether you will be able to get away from a specially built valve; however, a complete survey of all these companies will be of assistance to you.

HOW TO GET STANDARDS

We want to get copies of JIC Standards as they apply to hydraulic cylinders and electrical circuits. To whom do we write?

LAWRENCE H. GAY
Industrial Sales and Engineering Co.
Houston, Texas

Copies of the JIC Standards, —hydraulic, pneumatic, electrical or lubrication—may be obtained from: JIC, P.O. Box 182, North End Station, Detroit 2, Mich.

WANT'S MORE BOOKS

Here's my check for $5.00 for Elmer Heiser's book "Air and Hydraulic Cylinders in Industrial Applications". I have found the book very helpful with practical information.

If you have any other good hydraulic engineering book which show hook-up methods, figuring out required hydraulic power units and hydraulic circuits, please send them to me.

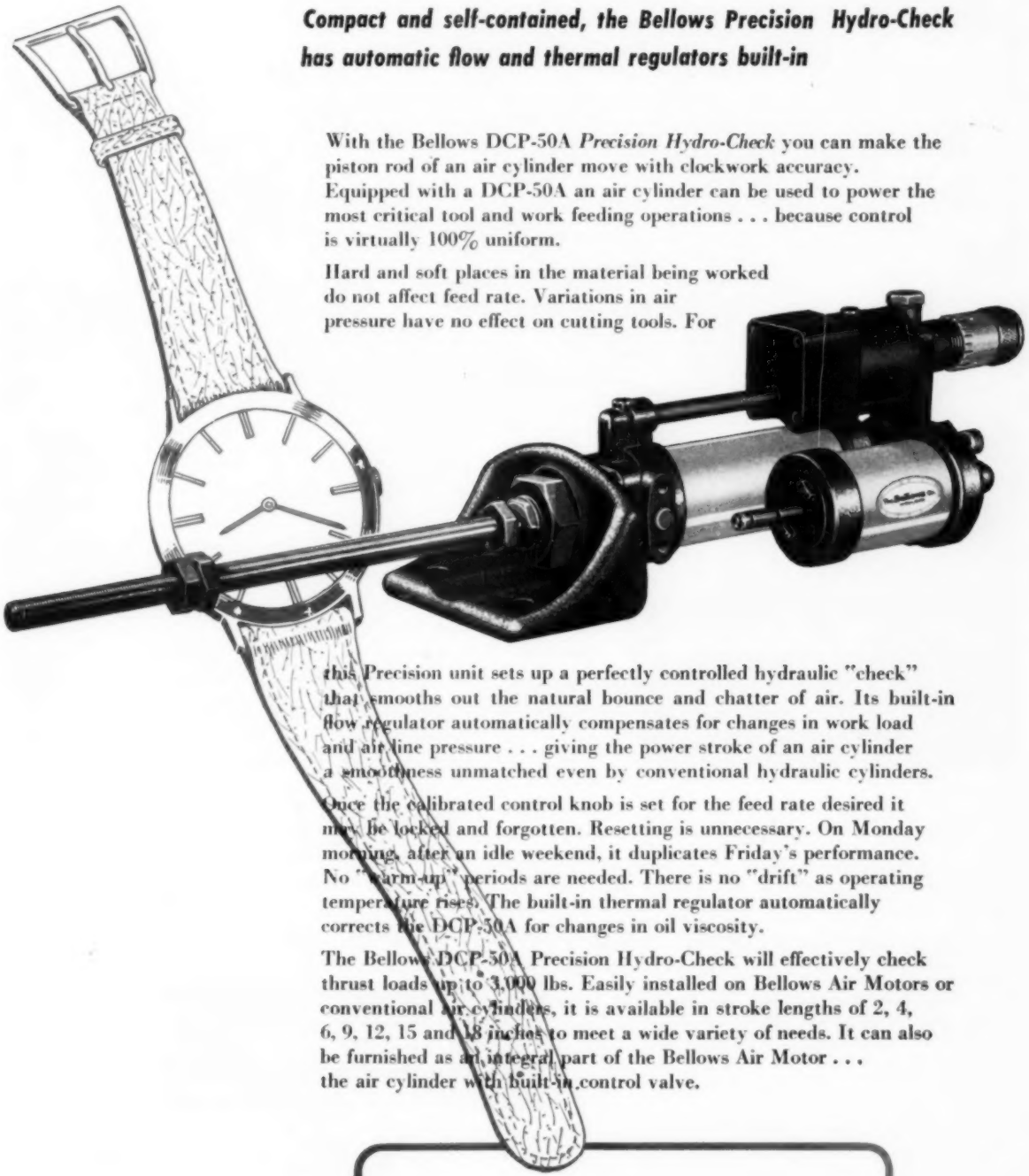
HENRY CALAS, JR.
Philadelphia, Pa.

This issue provides a complete bibliography of all available books in the fluid power field.

Circle 130 on Reader Service Card

This hydraulic unit controls air cylinder movement with *21-Jewel Precision*

Compact and self-contained, the Bellows Precision Hydro-Check has automatic flow and thermal regulators built-in



With the Bellows DCP-50A *Precision Hydro-Check* you can make the piston rod of an air cylinder move with clockwork accuracy. Equipped with a DCP-50A an air cylinder can be used to power the most critical tool and work feeding operations . . . because control is virtually 100% uniform.

Hard and soft places in the material being worked do not affect feed rate. Variations in air pressure have no effect on cutting tools. For this Precision unit sets up a perfectly controlled hydraulic "check" that smooths out the natural bounce and chatter of air. Its built-in flow regulator automatically compensates for changes in work load and air line pressure . . . giving the power stroke of an air cylinder a smoothness unmatched even by conventional hydraulic cylinders.

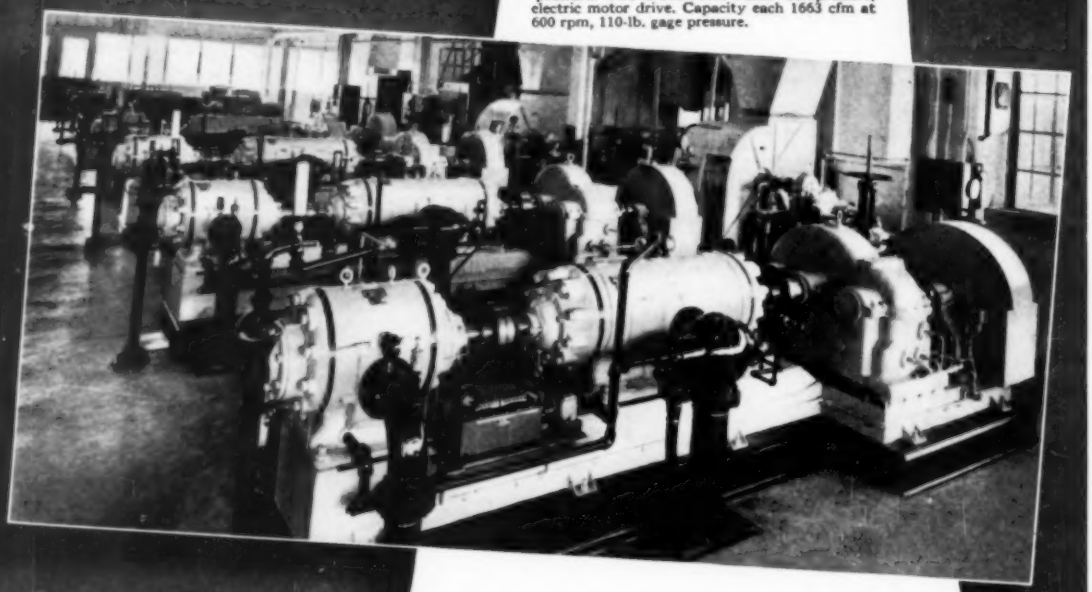
Once the calibrated control knob is set for the feed rate desired it may be locked and forgotten. Resetting is unnecessary. On Monday morning, after an idle weekend, it duplicates Friday's performance. No "warm-up" periods are needed. There is no "drift" as operating temperature rises. The built-in thermal regulator automatically corrects the DCP-50A for changes in oil viscosity.

The Bellows DCP-50A Precision Hydro-Check will effectively check thrust loads up to 3,000 lbs. Easily installed on Bellows Air Motors or conventional air cylinders, it is available in stroke lengths of 2, 4, 6, 9, 12, 15 and 18 inches to meet a wide variety of needs. It can also be furnished as an integral part of the Bellows Air Motor . . . the air cylinder with built-in control valve.

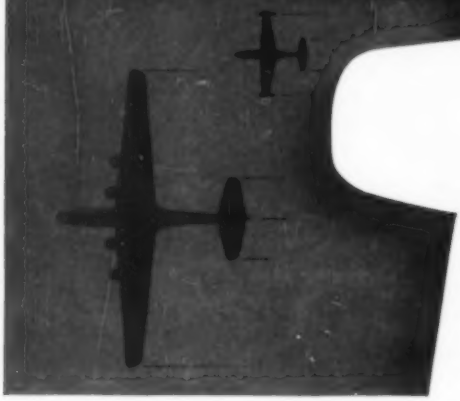
FOR COMPLETE INFORMATION ON BELLOWS HYDRO-CHECKS WRITE DEPT. AH-156

The Bellows Co.
AKRON 9, OHIO

1327A



Four C-300-300H Fuller Compressors, steam turbine drive. Capacity each 1248 to 1805 cfm with a corresponding speed range of 450 to 650 rpm; one 125 and three 110-lb. gage pressure. Two C-300-300H Fuller Compressors, electric motor drive. Capacity each 1663 cfm at 600 rpm, 110-lb. gage pressure.



PUTTING THE AIR IN AIRCRAFT

Aircraft companies use a lot of compressed air in the manufacture of airframes, engines, systems and components. The battery of six Fuller compressors pictured above meets one important aircraft facility's entire diversity of compressed air needs, efficiently and economically.

The key to Fuller's smoother operation is *rotary motion*, which provides large capacity in relation to size, simple direct drive from motor or internal combustion engine, minimum number of working parts, one-way air flow free from pulsation, lack of vibration, continuous service with minimum supervision and maintenance. Operation in cramped quarters or on ordinary flooring is simple and practicable.

Fuller Rotary Compressors are built for capacities to 3300 c.f.m., 125-lb. pressure. Write for Bulletin C-5A, illustrating and describing these machines.

Fuller

. . . . pioneers in harnessing AIR

C-274
1776

FULLER COMPANY, 142 BRIDGE STREET, CATASAUQUA, PENNSYLVANIA

GENERAL AMERICAN TRANSPORTATION CORPORATION SUBSIDIARY

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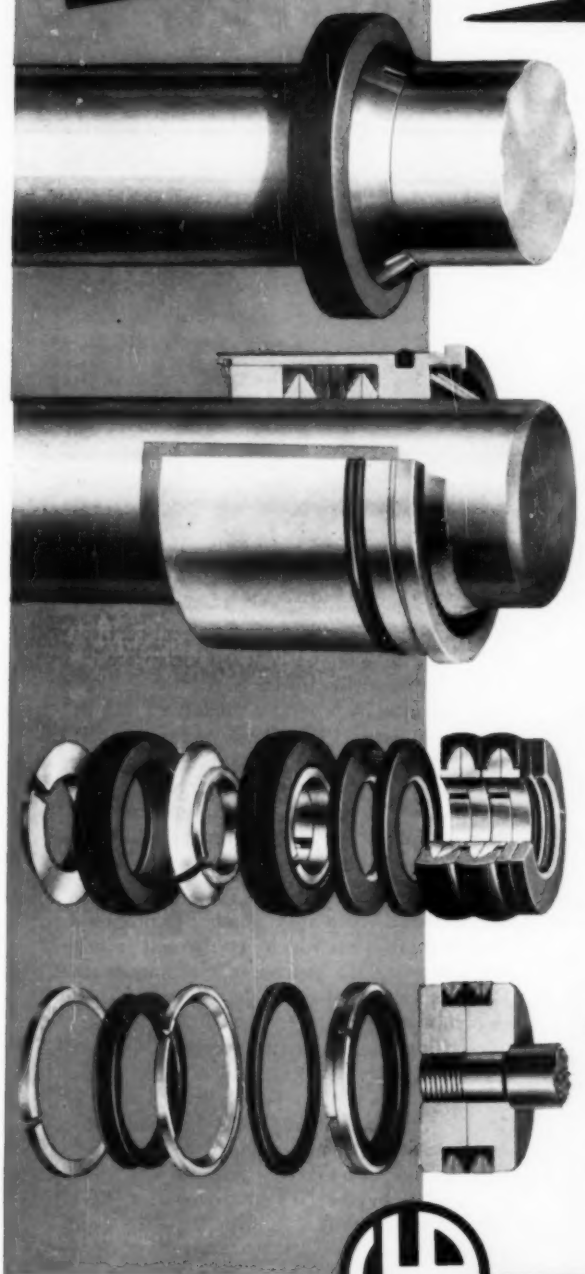
Circle 66 on Reader Service Card

the Industry's Best

METALLIC PACKINGS AND ROD WIPERS FOR HYDRAULIC AND PNEUMATIC APPLICATIONS



Seal-Guard® METALLIC ROD WIPERS

Seal-Guard Rod Wipers effectively protect cylindrical surfaces from foreign matter. Two flexible bronze rings with knife-edged conical surfaces, mounted in synthetic rubber, lift all harmful substances completely off the rod.

MONOPAK CARTRIDGE

The Monopak Cartridge is the original, replaceable, compact unit that combines all the necessary packings, bearings and rod wipers for air or hydraulic cylinders. It requires no special skill to install or replace, needs no adjustment, reduces initial machining expense and cannot be tampered with in any way.

MONOPAK ROD PACKING

The Monopak Rod Packing was specially developed to incorporate all the advantages of the Monopak Cartridge into a rod packing. These packings are made in all sizes or combination of sizes for any hydraulic or pneumatic cylinder.

MONOPAK PISTON PACKING

Available for one piece or two piece pistons. The packing has all the long wearing, trouble-free characteristics of the automotive type piston ring plus the added advantage of leak-free operation.

FOR COMPLETE INFORMATION AND SPECIFICATIONS WRITE

HYDRAULIC ACCESSORIES CO.
24301 HOOVER ROAD
VAN DYKE (DETROIT) MICH.

Circle 86 on Reader Service Card

BRIEFS about fluid power

TRADE ASSOCIATION: What is it doing?

Marketing, management services, and technical boards of the NFPA go into action to gather facts . . . aim is toward helping members in such areas as distribution, education, government relations, taxes and component ratings.

Report of the management services board was given by A. F. Jensen, Hanna Engineering Works. Ray Murphy, The New York Air Brake Company, reported on the work of the public relations committee, and David Fromson, Greer Hydraulics, Inc., discussed legal affairs.

John J. Pippenger of Double A Products Co., NFPA's vice president, introduced W. R. Lockridge, seated at his right, who gave the report of the marketing board. Barret Rogers, NFPA's executive secretary is on Pippenger's left.

Year end meeting: Service and trade associations go together. Projects discussed at the recent meeting of the National Fluid Power Association point to greater service to its members and their customers.

A marketing board, a management services board and a technical board, which were established in earlier meetings of the NFPA, really got their programs underway at the last meeting for 1955. While many of their projects are still in the proposal and planning stage, they show promise of supplying assistance to members of the association. These activities will, in the long run, prove helpful to the users of fluid power components.

Marketing: There are a number of proposed marketing projects which could result in better service to the purchaser of components. For example, studies to determine the best channels of distribution, distribution policies, advertising, and business forecasts as they relate to the fluid power field are being considered. The marketing board, headed by New York Air Brake's W. R. Lockridge, will serve as a fact finding body to gather and correlate information on marketing projects which are undertaken by the NFPA. In his talk, "We Can Make It—But Can We Sell It?", Bill Lockridge asked, "Has the marketing effort in the fluid power field been neglected?" He pointed to a study which shows that money put into product development is eight times

Continued on page 20

Check **THESE REASONS** ***and you'll see why you get better performance when you***

Specify **conpor**

controlled porosity Sirvis mechanical leather

LOWER TORQUE

Specially treated Sirvis-Conpor members available in C/R Oil Seals greatly reduce torsional drag, won't score shafts. They provide positive sealing over longer service life, are completely self-lubricating. Write for detailed information.

MINIMUM FRICTION

Want low sliding friction in hot, fast, high pressure applications? Sirvis-Conpor cups and packings can be custom-treated to your most exacting specifications. Won't chatter, score cylinders.

BETTER POROSITY CONTROL

The wide range of Conpor treatments . . . from practically unfilled to virtually non-porous leather permits packings with exact leakage and lubrication control, increased life. Stable in a wide variety of oils, gases, solvents.

SIRVIS C/R DIVISION

CHICAGO RAWHIDE

CHICAGO RAWHIDE MANUFACTURING COMPANY

1293 Elston Avenue • Chicago 22, Illinois

Offices in 35 principal cities. See your telephone book.

In Canada: Distributed by Super Oil Seal Mfg. Co., Ltd., Hamilton, Ontario

Export Sales: Genn International Corp., Great Neck, New York

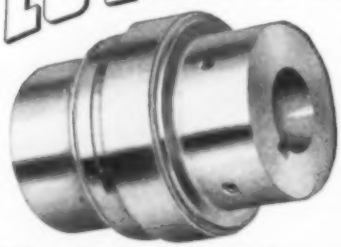
OTHER C/R PRODUCTS

C/R Shaft & End Face Seals • Sirvene (synthetic rubber) molded plastic parts • C/R Hydraulic Gears

15 YEARS SERVICE WITH ONE SET OF CUSHIONS

... actual report on

LOVEJOY



Flexible Couplings

Up to fifteen years maintenance-free service is not unusual with Lovejoy lubrication-free flexible couplings.

Performance like this is practical proof of these soundly engineered features:

SIMPLE, RUGGED CONSTRUCTION
Fewer parts. No intricate mechanisms. Nothing to lubricate.

LOAD TRANSMITTED BY CUSHION COMPRESSION
No wear on the metal jaws.

DOUBLE-LIFE CUSHIONS
One half of the cushions act as idlers—except on reversible loads. A quick interchange provides a new set of cushions. This can be done without dismantling the coupling.

Illustration at right shows a Lovejoy Type CF flange-mounted coupling. Rated at 160 hp., 800 rpm., this space saver connects drive shaft between diesel power unit and generator.

You can get Lovejoy performance for your application.

Let us know your requirements or request complete-line catalog.

LOVEJOY FLEXIBLE COUPLING CO.

4837 W. LAKE STREET • CHICAGO 44, ILLINOIS

Mfrs. of Flexible Couplings, Variable Speed Pulleys and Transmissions, Motor Bases and Universal Joints.

BRIEFS continued

Charles Ledig, National Pneumatic Company, W. B. Kuhnke, Hanna Engineering Works, Otto Maha, Hannifin Corp., and L. R. Burger, Logansport Machine Works, Inc., take a break between sessions.

Ed Greer and Mrs. and Mr. Hyman Ledeen chat together at the Chicago meeting.

Bruce Tilden, Kirkgasser Drew, Marty Engebretson, Oilgear company, and Dave Shanks, Hanna Engineering Works, meet after the session on marketing.

more than money spent on marketing. He also mentioned a recent survey made to learn what users of fluid power components want. The survey indicated that in many cases the user was not familiar with what is presently available.

Education: One of the committees of the Management Services board is undertaking projects to help the user become more familiar with the application of fluid power. A step in this direction is the completion of a fluid power brochure which will be widely distributed during coming months by member companies.

Government relations: Here's an area in which a committee headed by David Fromson, Greer Hydraulics, has been very active. This group is also a fact finding body to help answer questions dealing with tax matters, antitrust, and the Federal Trade Commission.

Mr. Fromson pointed to several results of discussions between the Business and Defense Services Administration of the Department of Commerce. The BDSA has 25 divisions covering practically all classes of machinery, equipment and materials. Representatives of NFPA discussed with BDSA the classification of its members' products in these divisions. A survey showed that these products were spread out in 11 classifications. A

Continued on page 22

the POWER you need in 1/3 less space . . .

O-M

CYLINDERS

TIE ROD-LESS

- *air and hydraulic*
- *meet JIC standards*

O-M's special interlocking mechanism strips unnecessary bulk, does away with tie rods and out-sized end caps . . . saves up to 1/3 the installation space required by conventional-type cylinders of the same bore.

This internal locking feature means less maintenance, too, O-M cylinders are easier to clean, inspect, remove, disassemble and service, with no alignment problems in re-assembly.

Available in complete range of sizes (1½ to 8" bores), with standard, 2 to 1 or oversize rods. All steel construction with bearing bronze. Completely interchangeable parts. Immediate delivery on many sizes.

mail coupon now!

for FREE catalog, showing all cylinders, mounts and mounting brackets.

ORTMAN-MILLER MACHINE COMPANY
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☐ Have representative call ☐ Send latest catalog

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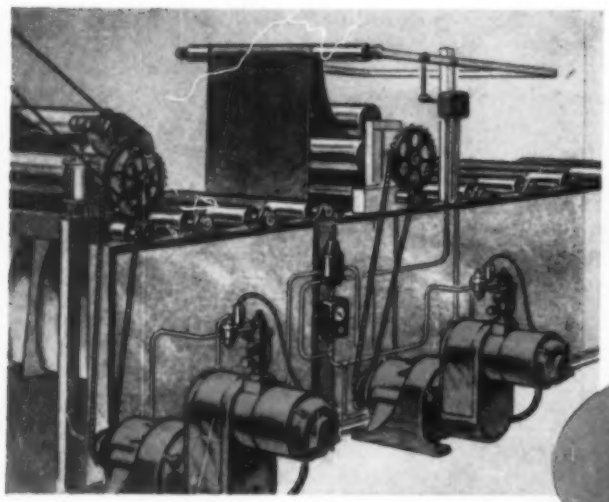
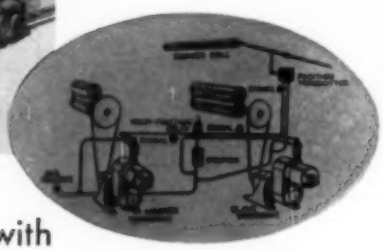
automation in action



EXAMPLE:

SYNCHRONIZATION

Speed of "master" Varidrive is set to desired speed of material. The floating or dancer roll in this process maintains a constant tension. Movement of dancer roll signals "slave" Varidrive to produce proper speed for take-up material.



Accomplishing Automatic Control with VARITROL as a component of the U. S. VARIDRIVE

By controlling motor speeds with the Varitrol as a component of the U. S. Varidrive motor, speeds can be automatically changed in response to a signal without human attention for precision-control operations. Above is shown just one of the many ways in which Varitrol automatic control of U. S. Varidrive motors can be used for automatic production control. Varitrol applications obtain efficiency and economy in industrial processes through outstanding savings in processing material, fuel and labor costs.

ADAPTABLE FOR A VARIETY OF DUTIES:

- Constant Pressure
- Proportional flow
- Constant Liquid Level
- Program Control
- Multiple Motor Control
- Filter Control
- Machine Tools
- Constant Cutting Speed
- Speed Control
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- Constant Flow
- Constant Temperature

Send for Information—8-Page Full Color Booklet On Automatic Control

U.S. ELECTRICAL MOTORS Inc. AH-1
P.O. Box 2058, Los Angeles 54, Calif. or Milford Conn.

☐ *Send Varitrol Automation Booklet No. 1882*
☐ *Send U.S. Varidrive Booklet No. 1797*

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COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

U. S. VARIDRIVE
WITH VARITROL®
AUTOMATION WITH VARIABLE SPEED

BRIEFS continued

reduction in classifications is desirable to expedite dealings with the government. The list of components submitted to BDSA by the NFPA were reviewed and coverage was reduced to six divisions:

accumulators, heat exchangers, aftercoolers—Power Equipment Division

couplings, fittings, cylinders, strainers, lubricators, packings, seals, valves —General Components Division

fluid motors (hydraulic), pumps (hydraulic), filters, separators—General Industrial Equipment Division

fluid motors (pneumatic) and pumps (pneumatic)—Metalworking Equipment Division

test stands, instruments, tubing—Scientific and Technical Equipment Division

all classes of hose—Rubber Division

BDSA has also informed the NFPA about the requirements for forming an Industry Advisory Committee for fluid power systems and has pointed out that if NFPA believes that such a committee would be advantageous, the association can make such a recommendation. Members of the committees are appointed by BDSA and serve in advisory capacity to make suggestions to BDSA.

Technical board: Headed by Walter Kudlaty, Miller Fluid Power Co., this board outlined a pattern of technical objectives in seven areas: terminology, symbols, fluids, coding, rating, dimensions and service. Questionaires are being used to obtain definitions from which a glossary of terminology will be prepared. It was suggested that the recently published "Glossary of Terms" be revised every two years.

A survey of packing dimensions is also being carried out to determine the current status of dimensions which is the first step toward any future standardization.

A cylinder dimensional code will determine current mountings, envelop and porting dimensions. Results will show if there is any pattern of conformance on which standardization might be based.

Ratings: Can uniform ratings for components be established? This is one of the technical board's projects. Like standardization, it is a giant project. The first step is to determine what ratings are applicable. Here are some of the ratings users of fluid components would like to have: what's the temperature and pressure rating of the component; what fluid or fluids is it designed for; what's the capacity, speed, rotational direction, torque and normal overhung load for pumps and motors; what's the force, speed, inertia and pressure drop for cylinders; what's the capacity, pressure drop, pilot pressures, speed, environmental and electrical ratings of valves?

Schedule of future meetings:

1956 Spring Meeting—May 27-31—The Greenbrier—White Sulphur Springs, West Virginia

1956 Fall Meeting—October 30-31-November 1—Hotel Cleveland, Cleveland, Ohio

Standards: At the JIC panel session of the NFPA two dividends were reported that have come to the fluid power industry as a result of the development and acceptance of the JIC Standards for Industrial Equipment.

Guest speaker, Don Morrell, Ford Motor Co., focused attention on the first dividend—the acceptance of fluid power by several large users, an acceptance which has been a major factor in the progressive, dynamic growth of the hydraulic and pneumatic industries.

The second dividend was pointed out by several members of the panel. This dividend is the improved equipment and better materials and services which have resulted from efforts to meet or exceed the performance required by the JIC Standards. ▼▼▼

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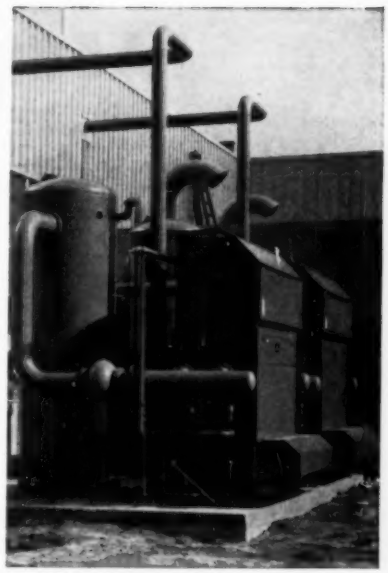


This Niagara Aero After Cooler also cools compressor jacket and intercooler water.

COMPRESSED AIR
• Lower in Cost
• Drier and Cooler

THE NIAGARA *AERO* AFTER COOLER offers a completely self-contained method replacing both shell-and-tube cooler and cooling tower. It is independent of a large supply of cooling water and consistently reduces compressed air temperatures to below ambient.

Drier air gives you better operation and lower costs in using all air-operated automatic instruments, tools and machines, paint spraying, sand blasting and moisture-free air cleaning.

Direct saving in the cost of cooling water saves the price of the Niagara *Aero* After Cooler in less than two years.

Niagara *Aero* After Cooler assures all these benefits because it cools compressed air or gas below the temperature of surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air through a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter, proven in service on the largest plant utility systems.

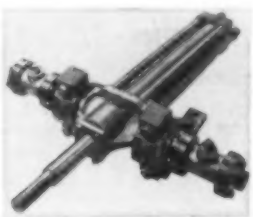
Write for Bulletin No. 130

NIAGARA BLOWER COMPANY
Dept. AH, 405 Lexington Ave.
NEW YORK 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada

LASSMAN Heavy Duty

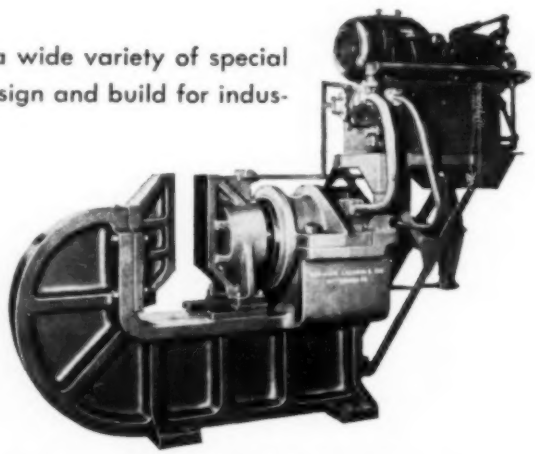
Industrial Hydraulic Equipment

These pilot operated check valves are available in sizes to 8" and pressures to 5000 p.s.i. for oil and water service. Piston type prefill or surge valves to 10"; directional control and special valves can be regularly furnished and provide smooth, non-shock operation.



A trunnion cylinder that requires no hoses is only one style in a quality line of single acting, double acting, and special cylinders. Forged steel barrels and rods, cast steel heads, and long bronze throat bushings are standard features. Built for pressures to 5000 p.s.i. and sizes including large bores and strokes for air, oil, and water service.

This 300 ton straightening press is one of a wide variety of special purpose presses and equipment that we design and build for industrial production processes and research.

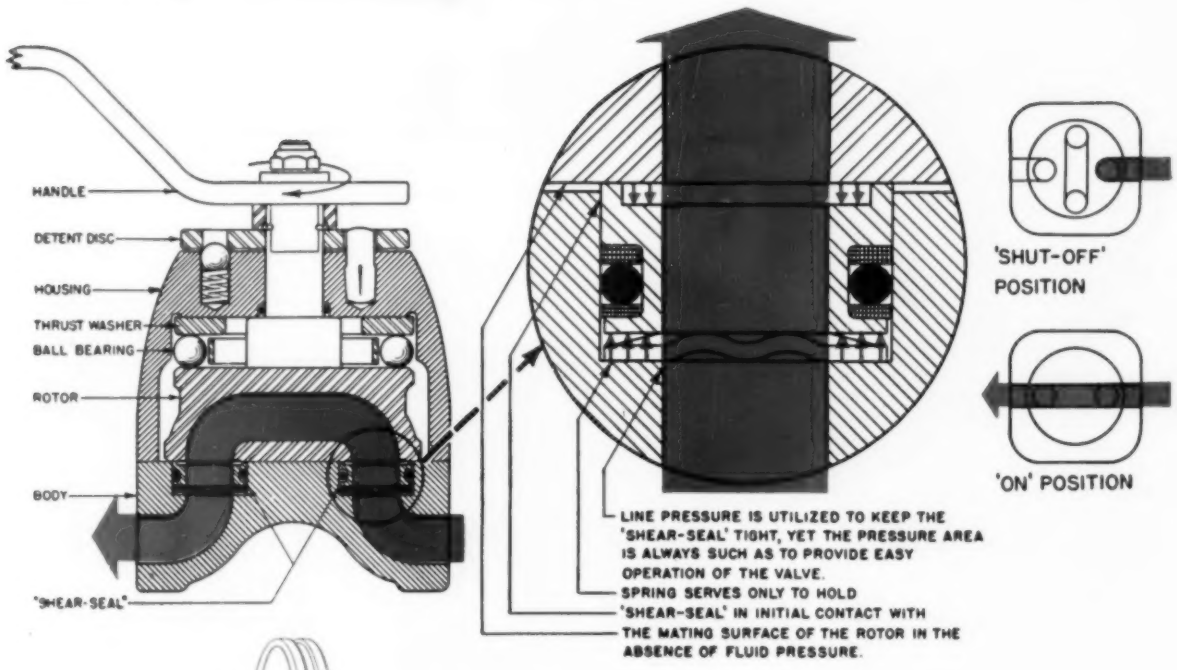


This packaged combination "hi-lo" pumping unit comprises the complete power and control source for an extrusion press. Similar units for direct pump pressures to 3500 p.s.i. and a wide range of capacities and control functions can be supplied to meet your requirements.

In addition to the specific items pictured and described, we can engineer and build a complete hydraulic system to meet the requirements of a given application. We will be glad to give you detailed information on Lassman systems and equipment.

Quality EQUIPMENT for *Quality* PERFORMANCE

BENJAMIN LASSMAN & SON Route 8, GLENSHAW, PA.


HANDLE
DETENT DISC
HOUSING
THRUST WASHER
BALL BEARING
ROTOR
BODY
"SHEAR-SEAL"
'SHUT-OFF' POSITION
'ON' POSITION
LINE PRESSURE IS UTILIZED TO KEEP THE 'SHEAR-SEAL' TIGHT, YET THE PRESSURE AREA IS ALWAYS SUCH AS TO PROVIDE EASY OPERATION OF THE VALVE.
SPRING SERVES ONLY TO HOLD 'SHEAR-SEAL' IN INITIAL CONTACT WITH THE MATING SURFACE OF THE ROTOR IN THE ABSENCE OF FLUID PRESSURE.

THE "SHEAR-SEAL" VALVE PRINCIPLE IS WELL WORTH YOUR STUDY

Cost and hydraulic control of many products have been improved through the incorporation of "Shear Seal" valves. Manual or Solenoid shut-off and selector valves will handle air, oil, water, grease, fuel and gas at pressures ranging from vacuum to 6000 PSI.

The patented "Shear-Seal" principle consists primarily of a pressure balanced, self-aligning, tubular valve seat, the "Shear-Seal," constantly in perfect contact with an optically flat porting disc, or rotor. The porting disc, or rotor, contains flow passages which are oriented by rotation of the rotor. Mating surfaces of the "Shear-Seals" and rotor are lapped to a five micro inch finish and are checked with monochromatic light waves to assure optical flatness within one light band per inch.

Rugged marcel compression springs maintain intimate contact at all times between the self-aligning "Shear-Seal" and the optically flat rotor. Positive leakproof closure is accomplished by means of this marcel spring, plus a predetermined hydraulic force on the "Shear-Seal." Thus, the higher the pressure, the tighter the seal. This controlled hydraulic load on the "Shear-Seal," in conjunction with large ball thrust bearings, is responsible for the exceptionally low handle load encountered with "Shear-Seal" valves, even at 6000 PSI operating pressures.

Actuation of a Barksdale Valve shears the fluid flow, (hence the name "Shear-Seal") and the square external corner of the "Shear-Seal" face wipes the rotor clean. Thus the sealing surfaces stay clean. Continuous intimate contact of "Shear-Seal" and rotor prevents dirt or foreign particles from entering between sealing surfaces. Dirt might otherwise hold the valve open, as with a poppet, or cause scored sealing surfaces and severe leakage, as with a conventional spool or slide valve.

Fluid flow always takes place through the opening in the center of the "Shear-Seal" rather than across sealing surfaces, (as occurs with a conventional poppet or needle valve). Sealing surfaces of the "Shear-Seal" and rotor are further protected by constant contact with each other. As a result, erosion or "wire drawing" are not experienced with "Shear-Seal" valves, even with extremely dirty, high velocity fluid.

Severe service over a period of years clearly shows that "Shear-Seal" valves improve with use because of the self-alignment and the self-lapping, wear compensating characteristics of the "Shear-Seal." Barksdale Valves actually "wear-in" where others "wear-out."

Long life and low maintenance cost have created wide acceptance in the field—indisputable proof of the soundness of the Barksdale "Shear-Seal" principle.

For the more complete story, visually explained in comic book sequence, write for "Super Seal explains the Shear-Seal principles." Included are some interesting cut-out models which further demonstrate the unusual characteristics of this valve principle.

BARKSDALE VALVES

5125 Alcoa Avenue, Los Angeles 58, California

Send FREE bulletin "Super Seal Explains the 'Shear-Seal' Principle."

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

AMERICAN CRUCIBLE knows Bearings!

Send Prints for Quotation

When you are looking for bearings, bushings and wearing parts that will stay on the job and give trouble-free service—SWITCH TO

Promet Engineered Bronze

GET THE GOOD, SOUND QUALITY THAT ASSURES EXCELLENT PERFORMANCE

Discuss your bearing problems with our metallurgists, engineers, and laboratory technicians. This service will in no way obligate you. Write for free literature and service data sheets or send blueprints, conditions of operation and data for recommendations and quotations.

PROMET

THE American Crucible PRODUCTS CO.

"Bearing Specialists Since 1919"

1303 Oberlin Avenue Lorain, Ohio, U.S.A.

Please send free literature and service data sheets on Promet Bronze.

NAME_____

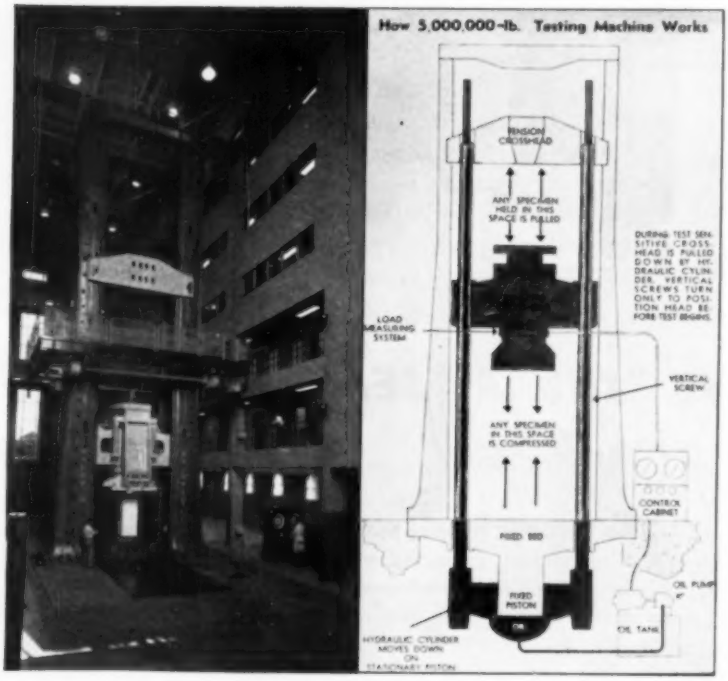
COMPANY_____

STREET_____

CITY & STATE_____

BRIEFS continued

FRITZ ENGINEERING LABORATORY HOUSES 5,000,000-LB TESTING MACHINE



The new seven-story addition to Fritz Engineering Laboratory on the Lehigh University Campus, Bethlehem, Pa., was recently dedicated. Devoted to the study of materials used for efficient, reliable and durable construction of machines, airplanes, ships, bridges and other structures, these new facilities will make available the most advanced equipment in the material testing field. The air-conditioned building includes 39 offices, a research library, seminar rooms, special laboratories for instruction, research and testing.

A hydraulic laboratory has three levels with pumps, tanks, turbines, weirs and other apparatus for research and industrial tests. A fully equipped laboratory machine shop and welding shop is available for the fabrication of test specimens and set-ups.

The new universal testing machine designed and built by Baldwin-Lima-Hamilton Corporation, is capable of applying both tensional and compressional loads up to 5,000,000 lbs. Height is approx. 60 feet above test floor, 16 feet below and weighs approx. 529,000 lbs. Loads are applied hydraulically by a movable cylinder on a stationery piston 54 inches in diameter which is mounted on the bottom of the base. Hydraulic pressure at maximum load is 2200 psi. The cylinder carries two vertical screws through which loads are applied on test specimens. The load measurement system is hydraulic and completely independent of the loading system.

Amsler Company of Switzerland manufactured a completely integrated set of jacks, pumps and load measuring devices designed to apply and measure repeated loads on structures, structural members or machine parts. ▼▼▼

Continued on page 28

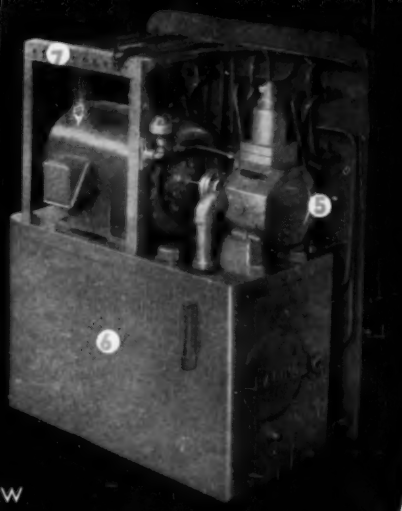
RACINE

HYDRAULIC POWER PLANTS

A RACINE packaged Power Unit offers you maximum flexibility in operation and performance. It comes complete, ready for immediate installation on your equipment.

The heart of this system, a RACINE Variable Volume Pump, conserves horsepower by putting all of the oil to work. Relief and By-pass Valves with extra piping are unnecessary. On this unit all control valves are neatly tubed to a terminal block from which connections are made to the machine.

FRONT VIEW



REAR VIEW

DESIGNED FOR YOUR NEEDS

These package units can be designed to meet your space and circuit requirements. All components are centrally located with the Control Valves positioned on an easily accessible control panel. Investigate the possibilities as applied to your products. Write for complete RACINE Hydraulic Catalog and the name of your nearest RACINE Field Office offering a complete engineering service.

KEY TO PARTS

1. RACINE FEED VALVE
2. RACINE DIRECT SOLENOID OPERATED 2-WAY VALVE
3. RACINE DIRECT SOLENOID OPERATED 4-WAY VALVE
4. GLOBE SHUT-OFF VALVE
5. RACINE VARIABLE VOLUME PUMP
6. RACINE OIL RESERVOIR
7. TERMINAL BLOCK

"They Work Better Together"

SALES AND SERVICE REPRESENTATIVES IN ALL PRINCIPAL CITIES

RACINE HYDRAULICS & MACHINERY, INC.

2074 Albert Street, Racine, Wisconsin, U.S.A.

BELMONT BEL-VEE

The "Pressure-Sealing" V-Ring Packing

SEATS AUTOMATICALLY

•

KEEPS EQUIPMENT RUNNING SMOOTHLY. CUTS MAINTENANCE

•

BASIC MATERIAL COMBINATIONS FOR VARIOUS SERVICES

•

A SIZE FOR EVERY ROD & STUFFING BOX

Scientifically designed to make the pressure seal itself, BEL-VEE Rings expand toward the rod and stuffing box wall, on the power stroke or with increased pressure, to automatically form the pressure seal.

On the return stroke, or with pressure relaxed, BEL-VEE Rings contract from the rod for free movement with minimum friction.

BEL-VEE Rings are individually molded in a number of basic material combinations. Offered in sets for pressures to 6000 psi. for sealing reciprocating rods of pumps, engines, compressors, hydraulic equipment and valve stems—handling water, oil, solvents, steam, air and gas.

BEL-VEE Rings are made in practically every rod and stuffing box size. Ask the U.S.G.-Belmont Distributor nearest you or write for Belmont Bulletin No. 4R10.

ask your U S G BELMONT Distributor

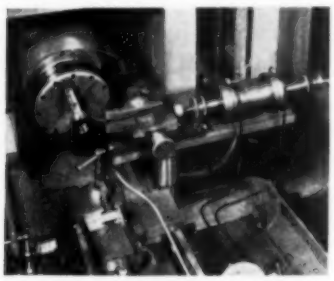
THE BELMONT PACKING & RUBBER COMPANY
Butler & Sepviva Streets
Philadelphia 37, Pennsylvania

U.S. GASKET • BELMONT PACKING

BRIEFS continued

Hydraulic Attachment Increases Machine Functions

An automatic hydraulic facing unit makes it possible for any boring machine to become a dual



purpose machine. It permits simultaneous facing and boring of ferrous and non-ferrous materials.

This hydro-face attachment, developed by Belock Instrument Corporation, consists of a main unit which includes a hydraulic piston assembly and facing compound slide with micrometer adjustments; hydraulic actuating valve; feed control dial for fine facing feed adjustments; hydraulic lines and fittings. ▼▼▼

Contour Machining Conference

Recognizing the increased requirements of difficult-to-machine designs, closer tolerances, larger contoured parts and new and harder metals in aircraft and instrument fabrication, True-Trace Corporation, headed by George F. Fry, Jr., president and Roy Rosebrook, chief engineer, recently sponsored the first annual Contour Machining Conference. The all day conference, attended by over 500 engineers from all over the country, included the showing of technical films, speeches and panel discussions. Here are some quotations from the papers presented.

" . . . the contouring of parts starts at the engineering drafting board with the approval of the tool engineering representative.

Continued on page 30

CUT COSTS

with the Original Mead

MIDGET AIR CLAMP

(Spring Return Air Cylinder)

In assembly jigs and other multiple applications, this new, low cost pressure unit saves countless man-hours. As a work-ejector in many fixtures, it is unexcelled.

Only $3.95 EITHER STYLE ($40.80 Per Dozen)

Advantages over mechanical clamps

1 **All Air Clamps** in any set-up can be operated by a single master valve—the "lock-up" and release of assemblies is instantaneous.

2 **May be installed in cramped corners** difficult to reach with bulky mechanical clamps. Mead Midget is the most compact air cylinder, for its power, on the market.

3 **Equal ram pressure at any point** along stroke, making special, delicate adjustments unnecessary.

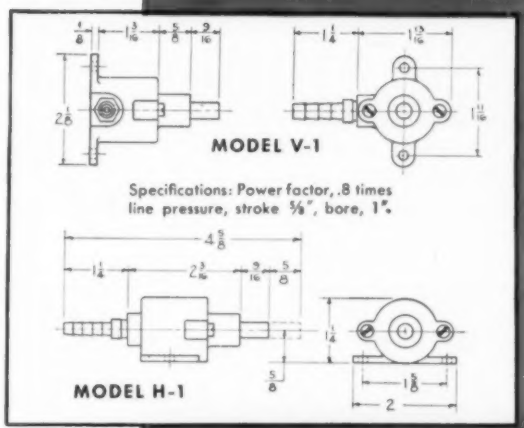
4 **Independent group control.** Any desired group of "Midgets" can be controlled independently of any other group in an assembly—as where primary members of the fixture must be locked up before the secondary members.

5 **Facilitates delicate drill operations.** Air Clamps actuated by foot control valves leave operator's hands free to handle the work pieces.

Send for all the interesting facts on these time-tested, superior Midget Air Clamps.

MEAD SPECIALTIES COMPANY

4114 North Knox Avenue • Dept. AH-16 • Chicago 41, Illinois



IMMEDIATE DELIVERY

Single-acting cylinders delivered from stock; double-acting in a few days.

Tear Out MEMO Coupon Now For

New MEAD INDUSTRIAL AIR POWER CATALOG

Full of suggestions for faster, cheaper production with famous **MEAD AIR-POWERED** Cylinders, Valves, Presses, Vises, Chucks, Hammers, Drill Press Feeds, Work Feeders, semi-automatic combinations, etc. Send today.

Memo Coupon

MEAD SPECIALTIES CO.

4114 N. Knox Ave., DEPT AH-16, Chicago 41, Ill.

Send free copy of new, colored MEAD INDUSTRIAL AIR POWER CATALOG describing the complete line of famous Mead air-operated devices.

Name_____

Company_____

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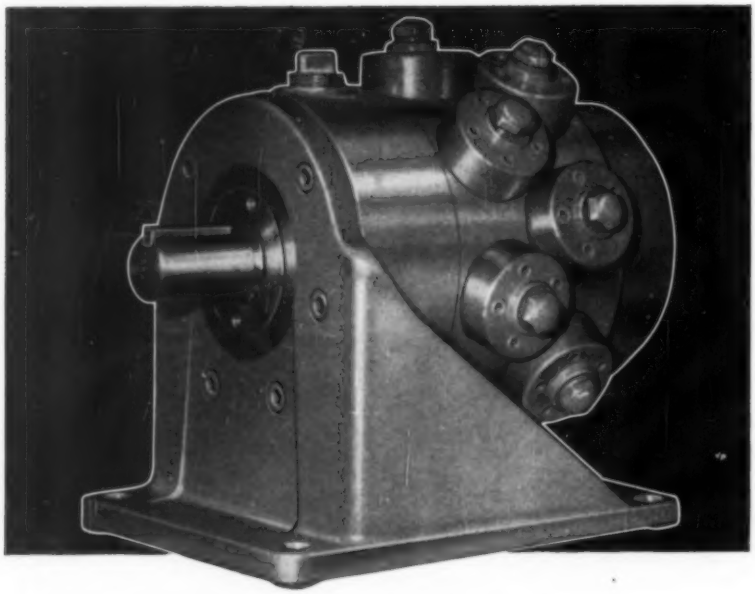
City_____ Zone____ State____



for HIGH HORSEPOWER— HIGH PRESSURE service

This Series "C" SECO heavy duty pump is a rugged, revolutionary answer to high pressure, high horsepower requirements. It opens up new horizons in the use of oil hydraulic power.

Pressure is developed *within hollow pistons*—making it possible to generate pressures up to 10,000 PSI without loss of mechanical efficiency. Each piston assembly is completely surrounded by high pressure lubrication and literally *floats* in a hydrostatic film of oil during its pressure stroke. A specially designed oversize Timken bearing assembly insures minimum friction and maximum area of contact at points of piston actuation. *Fluid timed* ball check valves insure quiet and efficient operation at all pressures.

Series "C" SECO pumps are at present made in 2 models, with the following characteristics:

MODEL		C-11	C-3
MAXIMUM PRESSURE, SPOT RATING.....	PSI	5,000	10,000
MAXIMUM PRESSURE, CONTINUOUS RATING	PSI	4,000	6,000
DELIVERY AT MAXIMUM PRESSURE.....	GPM	10	5
SPEED	RPM	1170	1170
POWER INPUT AT MAXIMUM PRESSURE....	H.P.	35	38

If you are interested in high horsepower, high pressure hydraulic power, you should have complete information on these heavy-duty pumps. Use the Reader's Service Card.

SECO

SERIES "C" "HOLLOW PISTON" PUMPS

SIMPLEX ENGINEERING CO.
ZANESVILLE, OHIO

BRIEFS continued

One of our airframes now in production, has 31 major items on the outside which require profiling and contouring; and the parts, at the present rate of production, require 24 vendors for their production . . . At Convair-San Diego we have adapted some of our equipment to trace control and on some parts an increase of 400 percent in production has been realized to date. To date, 150 jobs have been transferred to the tracer controlled machines with very little cost and tooling rework."

R. W. Peters, Supt. of Tool Engineering Plant No. 1 Convair, San Diego

" . . . The machine tool builders should soon begin to understand aircraft problems and produce economical special machines for the aircraft industry when they are given the true facts that it does not take a $250,000 skin mill to produce a 4 foot by 8 foot skin. It is our contention that the government should stockpile standard components such as hydraulic tracer valves, fluid motors, power units and other standard items utilized in special machines . . ."

W. B. MacKay, Supervisor Machines and Methods Development Group, Douglas Aircraft Co., Inc.

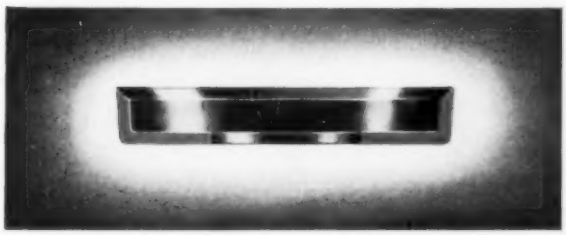
" . . . hydraulic tracing has resulted in a very substantial cost reduction in fixtures, inspection and scrap. It also makes the use of semi-skilled labor feasible and results in an average reduction of actual running time of approximately four to one, plus the ability to do jobs that would be real problems by any other method."

Thomas Gibson, Staff Assistant to Vice-President in Charge of Manufacturing, Consolidated Engineering Corp.

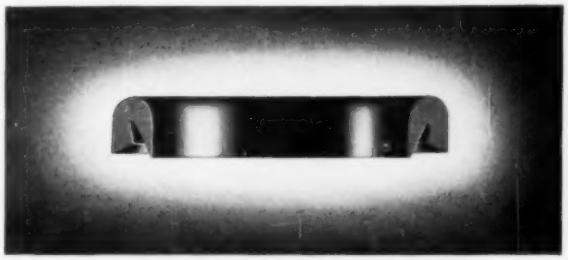
Continued on page 34

Simplify your sealing problems...

with Johns-Manville Precision moulded packing designs for pressure applications in hydraulic and pneumatic equipment



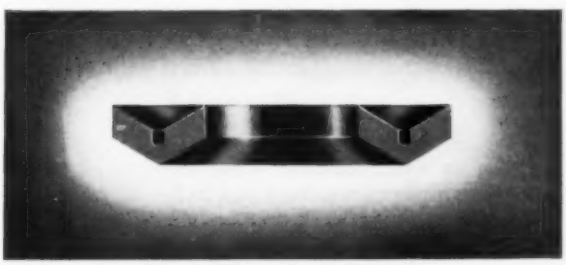
1. Type "A" Packing Cups for pistons
(the original "square heel" cup design)



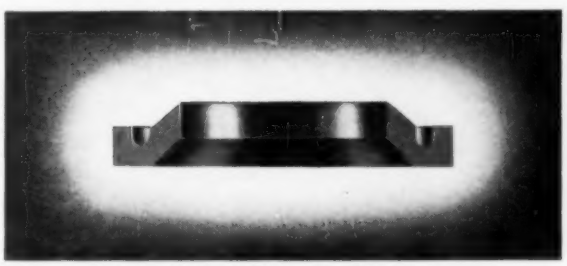
2. Sea Ring packing for rods

3. Uneepac Packing for rods and pistons

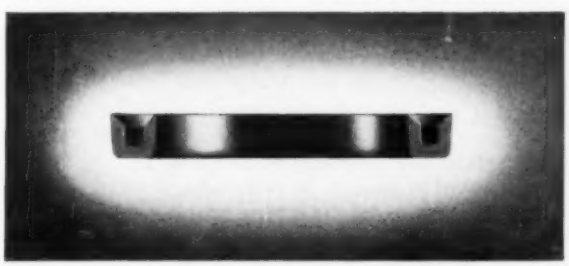
4. Hat Cup Packing for rods



5. V-Rings packing for rods and pistons



6. Cumpac #239 packing for rods

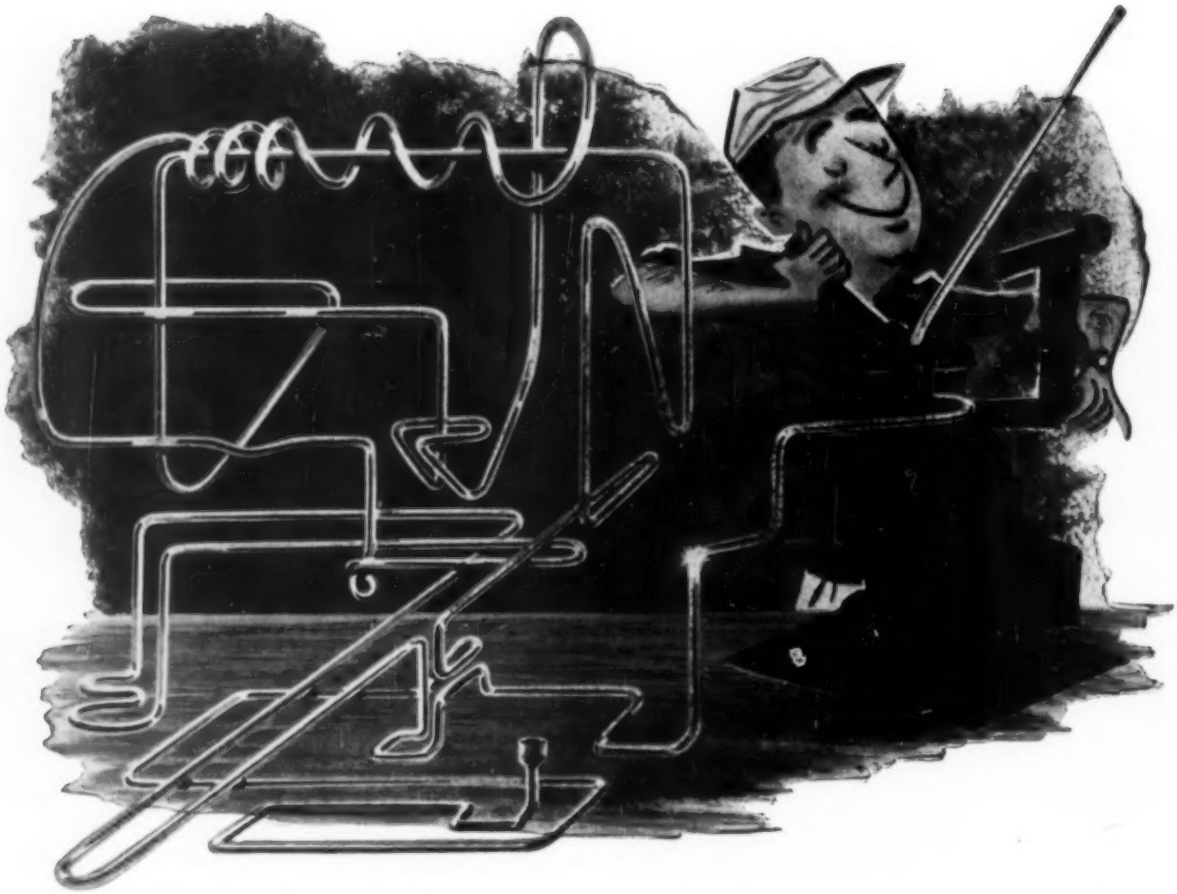


7. U-Cup Packing for rods and pistons

THE WIDE VARIETY of Johns-Manville Packing designs enables you to handle practically any sealing problem. The designs shown on this page are obtainable in a broad range of standard sizes and in materials designed for either usual or special service conditions encountered in hydraulic and pneumatic equipment. Johns-Manville also produces oil seals, moulded gaskets and miscellaneous shapes to specification. See your local J-M distributor or J-M sales office for product or engineering data. Or write Johns-Manville, Box 60, New York 16, N.Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville MOULDED PACKINGS



No Hydraulic Tubing job's too tough for us!

What's your hydraulic tubing problem? Unusual shapes? Special sizes or specifications? Whatever your problem, we're in a position to help you in a special way.

Our research, production and sales teams are small enough to give you the kind of personalized service that gets results when nothing else can. And they're big enough to get volume production going in a hurry on the special tubing you need.

Our modern plant is flexible, versatile and completely equipped to produce almost any type of cold drawn seamless tubing you can name—and produce it to *your* specifications. What's more, every operation at Summerill is laboratory controlled to give you consistent peak quality of product with every tube.

Why not let us tackle *your* hydraulic tubing problems? We'll welcome the opportunity to show you how Summerill Seamless Tubing can improve product quality and reduce costs. Address: Summerill Tubing Division, Columbia Steel & Shafting Co., Pittsburgh 30, Pa.

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HYDRAULIC TUBING • SPECIAL TUBING • MECHANICAL TUBING • DIESEL TUBING • PRESSURE TUBING • AIRCRAFT TUBING

Protect Hydraulic Systems 3 Ways

...WITH SINCLAIR DURO HYDRAULIC OILS

1. STOP RUST!

You stop rust everywhere in your hydraulic system with Sinclair DURO Oils! Water in the system can't reach metal surfaces because Sinclair's rust inhibitor is a preferential *metal-wetting* agent that plates out on surfaces, and stops moisture-to-metal contact.

2. FIGHT OXIDATION!

Two special inhibitors in DURO Oils give you extra protection against oxidation of the oil, and prevent the formation of oxidation by-products. Thus, your hydraulic system stays free of varnish, sludge and corrosive acid . . . highly important in today's advanced equipment!

3. PROTECT AGAINST FOAMING!

Sinclair adds a highly effective anti-foam agent to DURO Oils. This keeps air bubbles from being retained in suspension, thus assuring positive control and continuous lubrication with less wear. Sinclair DURO Oils give you smoother, *full power* transmission!

Look to the "big three" benefits of Sinclair DURO, the high viscosity index oils for hydraulic systems . . . they're designed to give you the maximum performance at the higher temperatures, greater pressures, and faster speeds of modern hydraulic systems. Your Sinclair Representative can give you full information, or you can write for literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation!*

SINCLAIR

DURO HYDRAULIC OILS

CHEMLON... *the Teflon* solution to your*

hydraulic cylinder packing problems

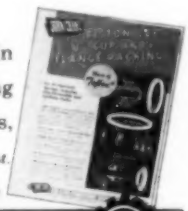
lasts longer in all hydraulic services including non-flammable and synthetic fluids

Once and for all . . . John Crane Chemlon Piston Cup, U-Cup and Flange Packings are the answer to handling *all* types of hydraulic fluids. Molded from chemically inert Teflon, they give positive sealing and long-lasting performance not possible with leather, fabric-reinforced or similar packings.

Heat will not cause these packings to shrink away from the cylinder walls or rod. They will not harden, shrink, swell or in any way disintegrate under higher temperatures often encountered in hydraulic service. Their exceptional thermal characteristics provide an operating range from −94°F. to +350°F.

Here . . . in a wide range of sizes or fabricated to your individual specifications . . . is a complete line of hydraulic packings to meet the need of any operating requirement.

Write to "John Crane" Send now for bulletin giving full technical and application data. Crane Packing Company, 6405 Oakton Street, Morton Grove, Illinois, (Chicago Suburb). *In Canada: Crane Packing Co., Ltd., Hamilton, Ont.*



*DuPont Trademark

JOHN CRANE **CRANE PACKING COMPANY** 38 YEARS INDUSTRIAL PROGRESS

OFFICES IN ALL PRINCIPAL CITIES

BRIEFS / continued

". . . The conventional milling machine tracer conversion accomplished many cavity mill operations on forgings, extrusions and billet material necessary for airframe manufacture, but more so it gave the industrial engineers experience with production of parts to tolerances formerly unheard of. . . . It was realized that if the material could be machined from both sides of the part simultaneously the warpage problem would probably be reduced. Therefore, North American Aviation built a machine known as a cavity mill. It is actually a duplex horizontal spindle, three dimensional pencil tracer milling machine for simultaneous milling of parts on both sides. . . . The unique part of the machine is the fact that the patterns are mounted on the carriage rail bed away from the work table. The pencil tracer feed back arm is mounted to the spindles in such a manner that it positions the tracer stylii in line with the patterns to enable the operators while standing at floor level, to guide the duplication requirements over the patterns. Inasmuch as this was unconventional, that is, removing the pattern away from the work piece, it permitted a design of a compact smaller type unit . . . When using a hydraulic rotary motor to motivate the carriages, the machine is capable of tracing parts as long as the rail beds and work table are extended."

Charles Morlath, Facilities Machine Tool Engineer, North American Aviation Company

". . . The much abused word automation really applies to moving subjects from one operation to another, each operation being performed at a fixed station under stable conditions. Automation has it problems but they are not of the same order as tracing a continuous line. . . . Tracing is a continuous process which calls for accuracy in motion".

Paul Dubosclard, Chief Engineer and Ex-President, Farnham Mfg. Co.

▼▼▼

Continued on page 36

Ledeen

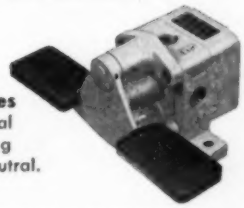
PNEUMATIC AND HYDRAULIC EQUIPMENT

VALVES
bulletin 1010

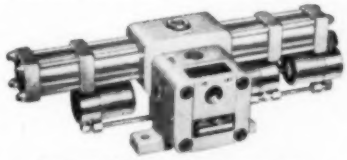
Hand Valves
Manual or spring return to neutral or to reverse.

Foot Valves
Single pedal spring return to reverse.

Foot Valves
Double pedal foot or spring return to neutral.

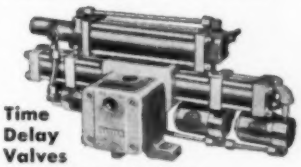


Power Valves
Two position, forward and reverse.



Power Valves Three position, forward, neutral and reverse.

Time Delay Valves
Power operated closing after delay interval.



CYLINDERS
bulletin 500

Heavy Duty Cylinders

Medium Duty Cylinders

Boosters

Special Cylinders

VALVE ACTUATORS
bulletin 3030

Gate Valve Actuators

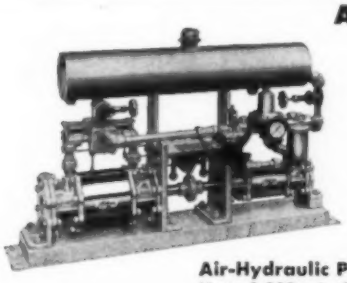
Diaphragm Valve Actuators

bulletin 3020

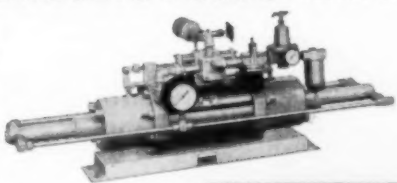
Plug Valve Actuators

Plug Valve Actuators

AIR HYDRAULIC PUMPS *bulletin 4000*



Air-Hydraulic Pumps
Up to 1,000 psi oil from 100 psi air or gas.

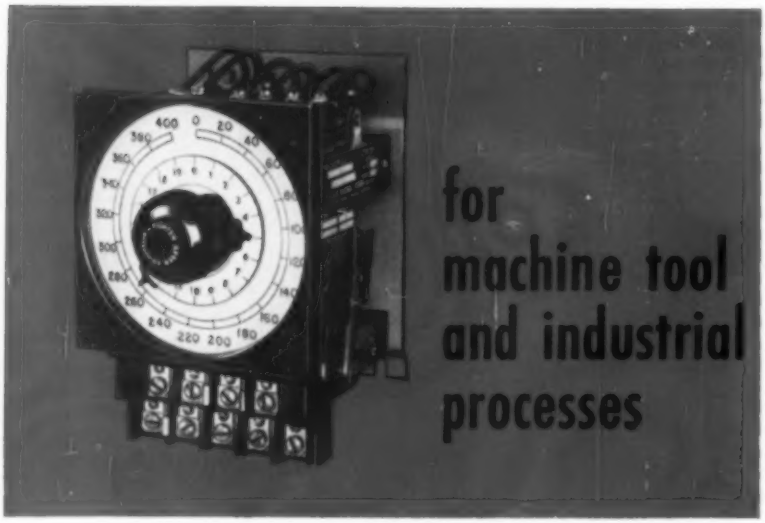


Air-Hydraulic Pumps
Up to 10,000 psi oil from 100 psi air or gas.

Ledeen Mfg. Co.
1610 So. San Pedro St.
Los Angeles 15, Cal.

Top quality—prompt delivery

EAGLE
Microflex reset counter



makes shutdown and feed-down automatic

Convert machine tool and industrial processes from manual to automatic operation — with this Microflex Reset Counter. For example, use it to feed a grinding wheel down after a preset number of operations. Or employ it to shut down a machine at the desired number of operations. This reset counter is ideal for controlling chemical feeding processes by shutting down a pump after the desired number of operations.

The Microflex Reset Counter is actuated by a series of electrical impulses. Models are available with 400 and 1000 count dials. Dial settings easy to make — counting range from 1 to 400 in steps of 1 with 100% accuracy. On 1000 count range, dial settings are in steps of 1 with accuracy of ± 1 count. Spring reset in less than 1 second.

MAIL COUPON TODAY

EAGLE SIGNAL CORPORATION
Industrial Timers Division, Dept. AH-156
MOLINE, ILLINOIS

Please send free Bulletin 720 containing full data on Microflex Reset Counter.

NAME AND TITLE

COMPANY

ADDRESS

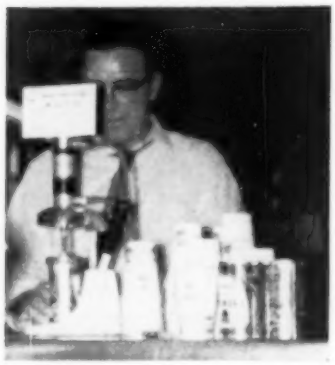
CITY ZONE STATE

BRIEFS continued

Beer Under Pressure

Here's a summer production idea in January.

When you're hot and thirsty, that cold beer can never get into



your hands fast enough! At a recent engineering show this problem was solved by the installation of an automatic can opener, loaned by the National Pneumatic Company.

Entitled "Pneumation In Action", this unit consists of a double acting air cylinder and is controlled by a manually operated valve, with the opener attached to the piston. ▼▼▼

Sight-Sound Presentation Of Fluid Power Components

Modernair Corporation, San Leandro, Calif., has introduced a portable, light, compact unit, featuring a built-in miniature wire recorder and a built-in screen for desk top viewing, to show fluid power applications, products and services of the company. Full color slides of plant facilities, products

Continued on page 38

CARTER

Send for this
COMPLETE FILE

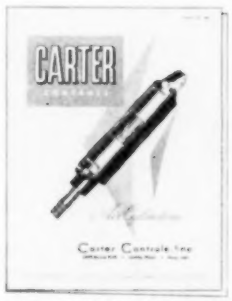
FLUID POWER BULLETINS

Here is the most advanced line of fluid power cylinders and controls in the industry. Simplicity of design is the key to all the benefits you get with Carter units. Cartridge type construction makes for *fast,* simple replacement of parts. *This means less down-time, less cost to you.* These units are rugged yet compact, thanks to key-type construction — no tie rods, no bolts. All mounting styles available. Integral steel head and mount, completely interchangeable size for size, permits production economies, faster deliveries. Check into Carter today!

THESE CARTER ADVANTAGES MEAN BENEFITS TO YOU

- Full 1 to 1 Meehanite rod bearings...easily replaced.
- Key-type stainless steel locking ring permits 360° rotation of pipe ports . . . removal of heads in a matter of seconds.
- Leakproof "O" ring seal, between head and cylinder wall.
- Integral cast steel head and mount.
- Spring loaded "V" packing on rod and gland.
- Precision honed heavy wall tubing...6 to 1 safety factor.
- Piston ring or cup packing construction.
- Perfect alignment . . . low coefficient of friction . . . high efficiency.
- Metal rod scraper, milled wrench flats, heavy duty, high tensile chrome plated piston rod . . . standard in all sizes.
- No increase in length for full cushioned cylinders.
- Spot-faced mounting holes for socket head cap screws.

Carter Controls, inc.
2972 Bernice Road • Lansing, Illinois
GRanite 4-3305



AIR CYLINDERS

Standard sizes 1½" thru 8"; stroke lengths to 18 feet; all standard mounting styles. Complete dimensions, specifications and parts data. All essential designing and ordering information. **Bulletin 100A.**

750 LB. HYDRAULIC

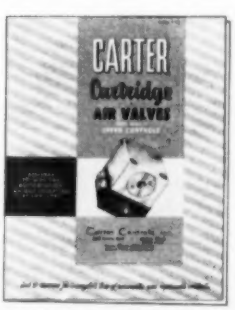
Complete range of standard sizes 1½" thru 8"; strokes to 18 ft.; all standard mounts. Complete details on parts, dimensions, and specifications. A light, compact cylinder for most design and plant applications. **Bulletin 750.**

1500 LB. HYDRAULIC

Carter's heavy duty hydraulic unit for pressures to 1500 psi. Bulletin gives full details on all standard sizes, 1½ thru 8". Strokes to 18 feet. Complete parts, dimensions and specification data. **Bulletin 1500.**

POWER PACK AIR CYLINDERS

The new Carter Power-Pack cylinder with built-in valve! Automates any operation. For solenoid, air-limit or remote air poppet control. Complete details in new **Bulletin 125.**



CARTRIDGE AIR VALVES

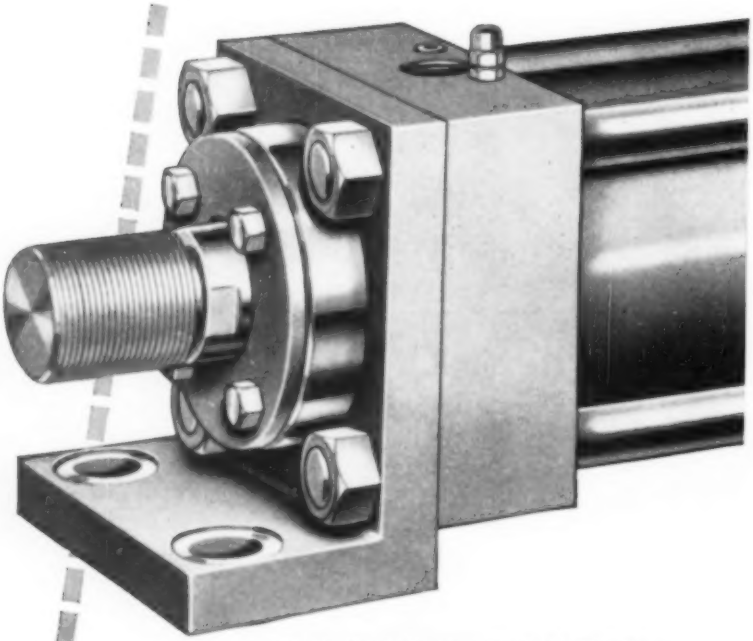
The new Carter cartridge air valve is compact, simple, and has many different applications. For operation with solenoids, lever poppets or palm poppets. Send for new **Bulletin V-150.**

CLAMP-TYPE CYLINDERS

The first all-steel, first line quality clamp cylinder to be offered at a competitive price. Incorporates all the rugged dependability of the standard Carter line. **Bulletin CT-1000.**

Circle 35 on Reader Service Card

consistent dependability



H-P-M Job-Proved Cylinders Assure Uninterrupted Performance

H-P-M cylinder construction deserves your close examination—here's a line that's built to take it. We know—we've used them on our own heavy press equipment for years. They're without equal for strength, precision and power. You'll appreciate the solid steel covers for safety, efficient rod packings and hydraulic seals, the accurately machined bore and automotive type piston—just a few of the outstanding features of H-P-M cylinders. Over 700 types . . . sizes to 12" bore . . . 150 (air), 300, 2000, and 3000 psi lines. Get the facts from your nearby H-P-M representative or write today for complete information. H-P-M also manufactures a complete line of hydraulic pumps, valves, controls and power units.

HYDRAULIC POWER DIVISION
THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.

HPM

BRIEFS / continued

and typical applications are seen, while the recorded voices of plant engineers and other personnel are heard. Each application is described and pictured with complete circuit diagrams.

This presentation, which can also be projected on to a separate screen, is available from authorized Modernaire sales outlets for in-plant engineering group meetings, technical society meetings, fluid power educational and training work. ▼▼▼

FUTURE EVENTS

January 23-26: Plant Maintenance and Engineering Show. Convention Hall, Philadelphia, Pa.

January 23-27: 24th Annual Meeting of the Institute of Aeronautical Sciences. Hotel Sheraton-Astor, New York, N. Y.

January 30-February 3: American Institute of Electrical Engineers' winter general meeting. Hotel Statler, New York, N. Y.

February 1-2: Midwest Welding Conference. Sponsored jointly by the Foundation and the Chicago Section of the American Welding Society. Armour Research Foundation of Illinois Institute of Technology, Chicago, Illinois.

February 27-March 2: American Society for Testing Materials. National Meeting. Hotel Statler, Buffalo, N. Y.

March 19-23: 1956 ASTE Industrial Exposition. International Amphitheatre, Chicago, Illinois.

May 1-4: SAE A-6, Aircraft Committees. Conrad Hilton Hotel, Chicago, Illinois.

May 14-17: Design Engineering Show. Convention Hall, Philadelphia, Pa.

June 5-8: The Material Handling Institute's Exposition of 1956. Public Auditorium, Cleveland, Ohio.

October 18-19: 12th National Conference on Industrial Hydraulics will be held at the Sherman Hotel, Chicago, Illinois. Conference Secretary is Raymond D. Meade. ▼▼▼

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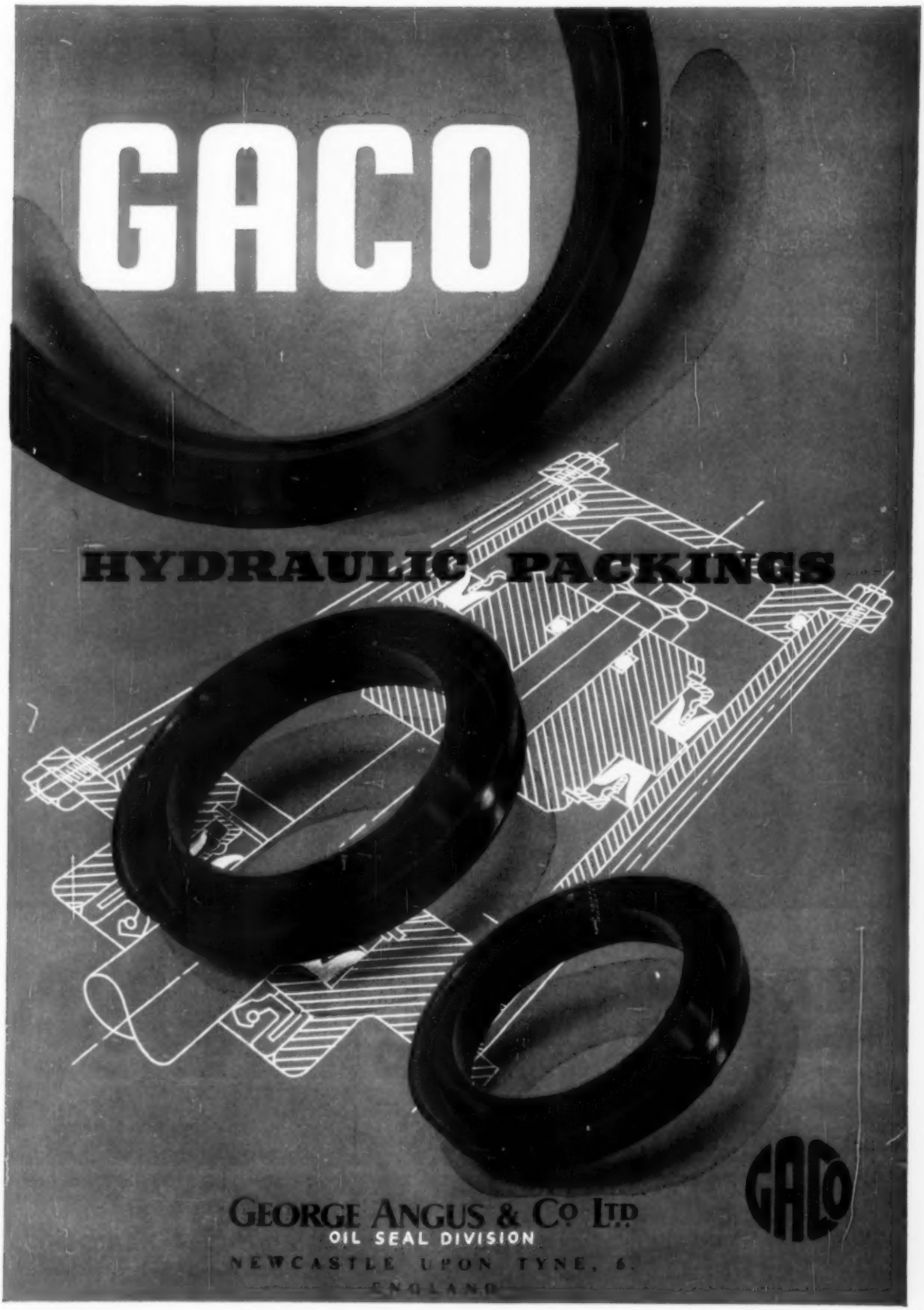
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HYDRAULIC PACKINGS
GEORGE ANGUS & Co LTD
OIL SEAL DIVISION
NEWCASTLE UPON TYNE, 6.
ENGLAND
GACO

DEPENDABLE HYDRAULIC

Have DENISON show you how to benefit...*NOW!*

You can depend on Denison for any hydraulic service to 5000 psi continuous . . . higher pressures for intermittent service.

With Denison's high pressures, you pack more power in

POWER...to 5000 psi

less space, cut weight, improve the efficiency of your equipment.

Take advantage of Denison's leadership in high pressure hydraulics. Let us show you exactly where and how your circuits can be improved.

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THE DENISON ENGINEERING COMPANY

1166 DUBLIN ROAD COLUMBUS 16, OHIO

A Subsidiary of American Brake Shoe Co.

New Products

Components, tools and equipment for fluid power systems. For more information fill in and mail post card bound in this issue.

SOLENOID VALVE

. . . with floating diaphragm

Design: Unit includes synthetic diaphragm float which provides greater fluid flow at lower pressure differentials. Pilot operated, it has no metal-to-metal contacts to wear. Operates satisfactorily with any pressure differential between 1 psi and 250 psi.

Features: Valves are available with or without manual operator that opens an auxiliary pilot port within the valve and allows systems pressures to actuate the diaphragm in a normal manner in the event of electrical failure.

Specifications: Available in a wide range of sizes, with port openings from 7/64 inch to 1½ inches diameter. Choice of screw, solder or flare connections.

Applications: For the control of air, water, light oils, and non-corrosive fluids at temperatures from 0 to 225 degrees Fahrenheit.

Jackes-Evans Manufacturing Co.
St. Louis, Mo.

Circle 201 on Reader Service Card

ROTARY AIR MOTOR

. . . at 2 hp

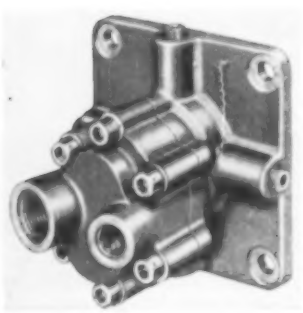
Designation: Model 6AM

Features: Weighing only 17 pounds, this air motor offers explosion-proof, variable-speed power with a simple valve control, over a range from 0-2000 rpm on air line pressures from 30-90 psi. Four light composition vanes slide in the rotor, maintaining a continuous, efficient seal and taking up their own wear automatically. The motor is constructed to start and run with shaft in any position. It cannot burn out if installed by overloads.

Specifications: Muffler and mounting foot are standard equipment. Single shaft extension with counterclockwise rotation is standard, clockwise rotation is available.

Gast Manufacturing Corp.
Benton Harbor, Mich.

Circle 202 on Reader Service Card



AIRCRAFT HYDRAULIC PUMP

. . . has high volume per weight ratio

Designation: Model RG-15130

Features: A rotary gear, positive displacement pump, it is ruggedly built. Patented shaft seal permits flexibility of drive shaft. The design prevents cavitation and turbulence to the pumping area. Oil passages unload the gear teeth at the seal line. Oil bleeds are designed for counterclockwise rotation viewing drive end.

Specifications: Unit weight 2.6 pounds. Rated capacity 2 gpm at 3750 rpm and 1500 psi, 2 hp input. The large inlet port is ⅞ inch and discharge port 9/16 inch. Displacement is 0.18 cubic inches per revolution. For use in ambient temperatures of −65 degrees to +160 degrees F. Pump has standard mounting flange and 12 tooth spline drive to mate with AND 20001 engine pad.

Lear-Romec Division
Elyria, Ohio

Circle 203 on Reader Service Card

Continued on page 44

MARVEL Synclinal FILTERS

Answer DESIGNERS' S. O. S.

For Dependable Protection on all Hydraulic and other Low Pressure Systems

Simple, Balanced Design . . . is the answer to the growing preference for MARVEL Synclinal FILTERS. Designers are specifying Marvel Synclinal Filters to assure minimum maintenance and maximum protection. Results show Marvel Synclinal Filters superiority in maintaining the greatest degree of cleanliness of liquids in all hydraulic and low pressure systems with minimum downtime. Furthermore, when filter servicing is necessary, Marvels can be easily disassembled, cleaned and reassembled by any workman in a matter of minutes. Line types operate in any position and may be serviced without disturbing pipe connections.

Again and again, Marvel Synclinal Filters have demonstrated they meet all requirements of the most exacting users, that today—OVER 600 ORIGINAL EQUIPMENT MANUFACTURERS install Marvel Synclinal Filters as standard equipment!

MEET J. I. C. STANDARDS

VISIT OUR EXHIBIT
Booth #1028
TOOL ENGINEERS
1956 INDUSTRIAL EXPOSITION
and CONVENTION
International Amphitheatre
Chicago, Illinois
March 19 thru 23, 1956

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G. P. M. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

WATER FILTERS

Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.

IMMEDIATE DELIVERY!

As in the past, Marvel continues to offer IMMEDIATE DELIVERY.

FILTERS FOR FIRE-RESISTANT HYDRAULIC FLUIDS

Marvels most recent development is a filter for the efficient filtration of all types of fire-resistant hydraulic fluids.

Catalogs containing complete data available on request

MARVEL ENGINEERING CO.
7227 N. HAMLIN AVE., CHICAGO 45, ILL.
PHONE: JUNIPER 8-6023

Without obligation, please send me complete data on Marvel Synclinal Filters as indicated:

- ☐ Catalog No. 106 for Hydraulic Oils, Coolants, Lubricants
- ☐ Catalog No. 300 for Water
- ☐ Data on filters for fire-resistant hydraulic fluids

AH-1

Name _____ Title _____

Company _____

Address _____

City _____ State _____

IN AIR AND HYDRAULIC CYLINDERS DARCOVA PUMCUPS PERFORM MORE EFFICIENTLY AT LOWER COST AND LAST LONGER!

Precision-built and texture-engineered for practically all services, Darcova Pumcups outlast most other packings at least 3 to 1. Fluid slippage is virtually eliminated, assuring *continuous* high efficiency. Far less maintenance! Lower operating costs! Send today for a free bulletin packed with helpful data and proof.

DARCOVA
THE ORIGINAL COMPOSITION CUP

DARLING VALVE & MANUFACTURING CO.
WILLIAMSPORT 15, PA.

PUMCUPS

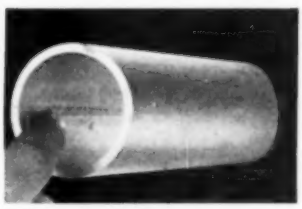
New Products / continued

WELDED STAINLESS STEEL TUBING

. . . eliminates weld bead on inside diameter

Designation: Trentweld Tubing

Features: Extremely smooth inside offers better surface and has improved corrosion resistance. Production of cold drawn tubing for



aircraft hydraulic lines, pneumatic systems and for small heat exchangers require high quality starting stock, which this type of tubing supplies. The smooth surfaces also minimize the possibility of fatigue failure.

Specifications: Tubing and pipe can be supplied in all the AISI stainless and special high alloy grades.

Trent Tube Company,
Subsidiary of Crucible Steel Co. of America
East Troy, Wisconsin
Circle 204 on Reader Service Card

MINIATURE SOLENOID

. . . delivers high actuating force

Designation: Model SD328

Features: Unit delivers 4.5 pounds at .020 inch stroke at 18 V.—D.C. and 6.5 pounds at .020 inch when operating on 24 V.—D. C. These forces are obtained at

78 degrees F., but ambient temperature range of —65 degrees F. to +165 degrees F. provides for

Continued on page 46

Easy-to-Apply CaPlugs Give "Kid Glove" Protection to Products in Process, Storage and Transit

Amazing multi-purpose closures of tough, flexible Polyethylene protect tubing, threaded fittings and machined parts

Buffalo, N. Y. (JC) Providing "kid-glove" protection for a tremendous variety of products, over 300,000,000 CaPlugs were used by thousands of industries before their 7th birthday. Extremely easy to apply, these adaptable closures are installed with impressive regularity on tubing, fittings, valves, hydraulic components and numerous machined parts.

Molded of flexible Polyethylene, CaPlugs are exceptionally tough . . . yet most kind to threads and polished surfaces. They are impervious to most common chemical reagents, acids and solvents . . . will not collapse, chip, break or shred.

Push them in . . . or push them on

TAPERED CAPLUGS can be used as caps or plugs, inside or outside of threaded or plain fittings. Time studies show that these versatile closures save up to 500% in labor costs.

MULTITUDE OF USES

- Dust Caps
- Pipe Caps
- Thread Protectors
- Tube Hole Protectors
- Valve Caps
- Oil Hole Covers
- Pipe Plugs
- Shipping Protectors
- Masking for Plating, Spray Painting, etc.
- Oil, Grease and Dust Seals
- Tubing Seals
- Sales Appeal

6 STANDARDIZED DESIGNS . . .
OVER 200 STOCK SIZES

TAPERED CaPlugs

EP & EC Caps and Plugs for Electrical Connectors & Receptacles

CD Threaded Seal and Shipping Caps

PD Threaded Plugs

SC Tubing Sleeve Caps

Threaded Pipe Plugs

Scores of users stress CaPlug advantages

". . . can be more readily installed than the protectors that we formerly used."
Scintilla Magneto Division

". . . features which interest us most: (1) Protection from damage to threads (2) Prevention of dirt entry (3) Price benefit (4) Appearance (5) Ease in installation (6) Easy removal after use."
A-P Controls Corporation

". . . they also help impress the customer with the steps that have been taken to protect the equipment."
Stewart-Warner Corporation

"They are much easier to install and consequently effect a considerable saving in installation man hours."
Lear, Inc.

"They offer an inexpensive, efficient, and secure source of protection . . . and are easily applied and removed."
Taylor Instrument Companies

Free "see-for-yourself" assortment mailed on request

CAPLUGS DIVISION, PROTECTIVE CLOSURES CO., INC.
2203 Elmwood Ave., Buffalo 23, N. Y.

MAIL a free assortment of CaPlugs, literature and prices to us immediately, without obligation.

Name_____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

Special Designs for Special Hydraulic Pump Applications

GEROTOR is noted for its precision-built line of standard design pump models, but unheralded, GEROTOR engineers are solving problems at the request of customers who have special design needs.

The precision manufacturing know-how of the GEROTOR organization is available when you have a special design problem. Whether this involves speed, capacity, limited space, mounting, weight or adaption to some peculiar operating condition, a specially designed GEROTOR HYDRAULIC PUMP may solve your problem.

Due to modern facilities, GEROTOR can produce special design pumps in *quantities* on an economical basis. Whatever your hydraulic pump design problem . . . bring it to GEROTOR.

FREE literature available . . . write:

GEROTOR

MAY CORPORATION

MANUFACTURERS OF—

1535 MARYLAND AVENUE, BALTIMORE 3, MARYLAND

Hydraulic Pumps and Motors

Variable Speed Hydraulic Transmissions

PneuBin—Pneumatic Bin Evacuators

New Products / continued

positive operation at rated capacity under widely differing temperature conditions.

Applications: Suitable for use with valve systems, gyros, indicators and systems requiring short stroke and extreme control accuracy.

Specifications: Unit is 1¼ inches high, including threaded connection, and ¾ inch in diameter. Solenoid is designed for continuous duty at 18 to 30 V.-D.C.

PSP Engineering Company
South Gate, Calif.

Circle 205 on Reader Service Card

TEST STAND

. . . for hydraulic equipment

Designation: ACL Model 2632

Features: Designed to stand hard usage for long periods, the self-contained unit gives performance data for almost all hydraulic system components, accessories, including valves, regulators, cylinders

and others. Equipment tests at infinitely variable pressure from 500 to 5000 psi. Variable flows up to 10 or up to 20 gpm are obtained by manual adjustment of a variable displacement pump. Prinicpal controls include cross gauge manifolding, oil temperature control and indication.

Specifications: Unit is 7 foot long, 40 inches deep and 76 inches high, and weighs approx. 1500 pounds.

Auto Control Laboratories
Culver City, California

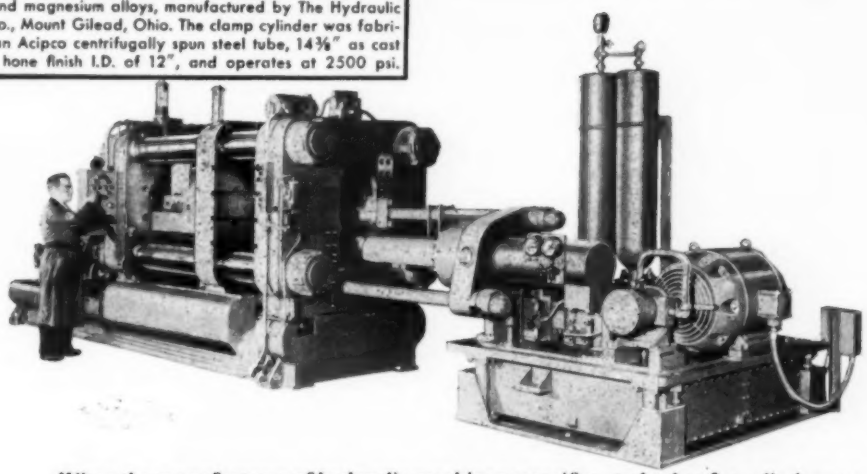
Circle 206 on Reader Service Card

For more NEW PRODUCT reviews turn to page 208

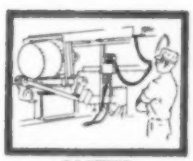
Lower Costs...Higher Pressures...Peak Performance

ACIPCO Centrifugally Spun STEEL TUBES

H-P-M 800-ton cold chamber die casting machine for casting aluminum, brass and magnesium alloys, manufactured by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio. The clamp cylinder was fabricated from an Acipco centrifugally spun steel tube, 14⅜" as cast O.D. with a hone finish I.D. of 12", and operates at 2500 psi.



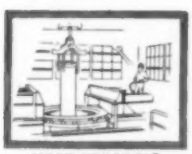
When the manufacturer of hydraulic machinery specifies steel tubes for cylinders, you can be sure he has considered *all* the requirements for the cylinders with more than just ordinary attention.



CASTING

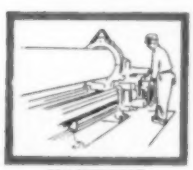
Hydraulic cylinders must withstand extreme pressures and rugged use over long periods. To meet these conditions, tubes must possess high strength physical properties and be of a dense, homogenous metal structure, free from any porosity. They must be made of steel of an exact alloy analysis.

And, from a purely economic point of view, these tubes must be reasonably priced . . . or offer a *distinct price advantage*.



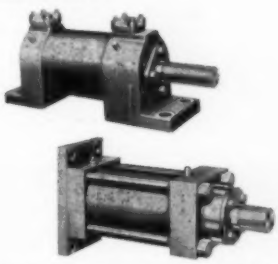
HEAT TREATING

The Hydraulic Press Manufacturing Company of Mount Gilead, Ohio, used Acipco heavy wall steel tubing in this 800-ton die casting machine. Many other manufacturers, as well, are calling on Acipco's complete, integrated facilities and production "know-how" for steel tubes which offer low cost, high quality and peak performance.



MACHINING

Acipco centrifugally spun steel tubes are produced in a wide range of sizes up to 16' lengths, with longer lengths furnished by welding tubes together. Outside diameters are from 2.25" to 50" and wall thicknesses from .25" to 4". All alloy grades, including heat and corrosion-resistant stainless steel, and plain carbon grades can be supplied. Special analyses are also available. Acipco centrifugally spun tubes can be furnished as cast, rough machined or finish machined, including honing. In large heavy wall sizes, Acipco steel tubes offer decisive price advantages over hollow-bored forgings.



Acipco centrifugally spun tubes are used successfully in many other types of hydraulic cylinder applications. Write, wire or call Acipco for complete information.

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TESTING and INSPECTION

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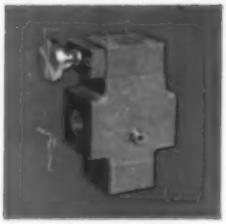
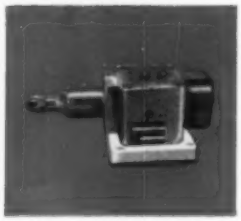
Offers you...

EXACT VALVE ACTION REQUIRED WITH FEWER VALVES AT LOWER COST

- ★ PIPE SIZES: ¼" THRU 2"
- ★ OPERATING PRESSURES: MODELS FOR 2000 P.S.I.–3000 P.S.I.–5000 P.S.I.
- ★ MOUNTING TYPES: CONNECTIONS IN BODY, SUB-PLATE MOUNTING, FLANGED CONNECTIONS



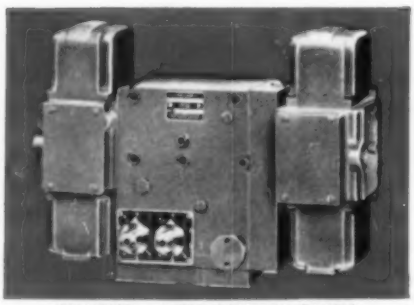
RELIEF VALVES



BY-PASS VALVES (for sequence and unloading applications)

BY-PASS and CHECK VALVES (for counterbalance and sequence applications)

REDUCING VALVES

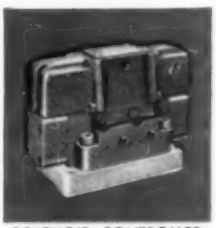


TRAVERSE and FEED CONTROL PANELS

REDUCING and CHECK VALVES

FLOW CONTROL VALVES

DIRECT SOLENOID VALVES



SOLENOID CONTROLLED PILOT OPERATED VALVES

WRITE FOR NEW FULL LINE CATALOG
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MEANT FOR EACH OTHER—

COOK Hydraulic Piston Rings

and Your Cylinders!

COOK SEAL-JOINT HYDRAULIC RING TYPE 101-SS

Diameter Range—3" to 60"

Unique, single-acting sealing ring for use in all grooves.

Seal-joint construction provides unbroken sealing surfaces against both cylinder wall and groove land.

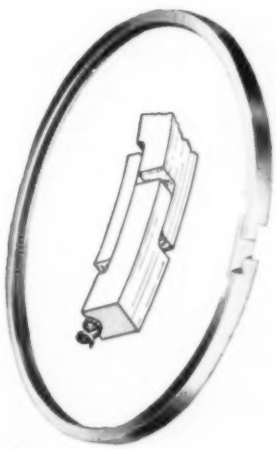
Less rings per piston are required because leakage through plain-ring gaps is eliminated.

One-piece construction insures easy installation.

WHATEVER your hydraulic piston-ring requirements, there's a C. Lee Cook ring to fill the bill. Each is carefully inspected to assure extremely close tolerances on roundness, circularity and other physical dimensions.

Because Cook Hydraulic Piston Rings are *built* better, with better *materials*, they provide longer ring life, reduce the rate of cylinder wear and eliminate cylinder scoring. They're available in sizes from 1½" to 60"—in exclusive Cook Graphitic Iron, bronze and special materials.

For recommendations and prices, write to Hydraulic Dept., C. Lee Cook Company, 986 South Eighth Street, Louisville 3, Kentucky.



COOK GAP-SEAL HYDRAULIC RING TYPE 301-1X

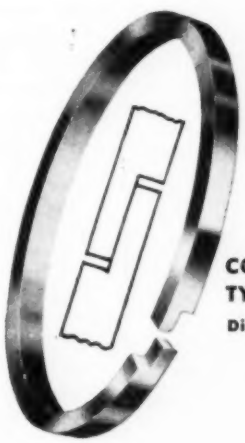
Diameter Range—3" to 60"

Complete flexibility assures perfect wall contact at all times. No wear-in period required.

Sealing is double-acting. Makes ring ideal for all services and simplifies installation.

Seal is complete at all points. Step-cut construction seals joint contact with cylinder. Special over-lapping gib seals joint at groove sides.

Spring actuation is independent of groove bottom. Assures uniform distribution of tension.



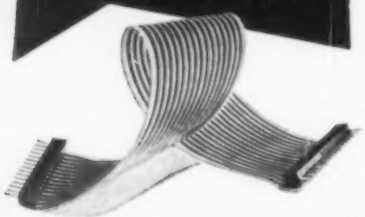
COOK STEP-CUT RING TYPE 101-1

Diameter Range—1½" to 60"

C. LEE COOK COMPANY

Sealing Pressures Since 1888

NOW!
Flexible Kel-F PRINTED CIRCUIT CABLES



developed by
Sanders Associates, Inc.

By means of an exclusive Sanders process, the versatile plastic Kel-F can now be laminated with copper in thin sheets to provide a flexible printed circuit cable. This unique development introduces an entirely new concept in the fabrication of multi-conductor cables or wiring harnesses. Excellent electrical and mechanical properties are supplied for operation over a wide range of environmental conditions. The complete encapsulation of the conductors in Kel-F ensures maximum protection against moisture. Glass cloth can also be included in the laminations for increased strength and high temperature stability.

FEATURES

- Excellent dielectric strength
- High degree of flexibility
- Lighter, thinner than many cables
- Maximum environmental protection
- Adaptable to many connectors
- Multi-layer construction available
- Suitable for chassis harnesses
- Wiring errors are eliminated
- Easily mounted

Write for engineering bulletin to Dept. AH-1

SANDERS ASSOCIATES INCORPORATED
NASHUA NEW HAMPSHIRE

Ideas from a Sales Engineer

Elmer F. Heiser

During Elmer Heiser's 19 years of selling air and hydraulic components, he has solved many problems and has left some unsolved. He is the author of the recently published book *"Air and Oil Cylinders in Industrial Applications"*.

Gremlins

ROBERT Burns once said that the best laid plans of mice and men often go astray. He didn't say it that way. His statement was framed poetically, and will probably stick around longer than this masterpiece. Fluid power equipment proves his point. So often these jobs look so fine on paper but the "astrays" creep in later. Fluid power systems frequently have as a built-in feature some of what may be called vagaries, idiosyncracies or just plain temperament.

Just to show how they work, we were mixed up recently in a job where a complete package system was to be furnished. It was understood and agreed in advance that someone would visit the ultimate customer and acquaint the operating and maintenance personnel with the various units in the system and advise as to adjustments, operation etc. The equipment was finished and it tested perfectly before shipment. A short time after shipment we received a call advising that they were ready to welcome a wind dispenser as agreed upon. However, not only did they want someone to explain the unit to maintenance personnel, they wanted a service man P D Q to even make it operate the first time. Some difficulty, vague, but serious, had developed between pre-shipment tests and actual operation at the site.

You can see that these fluid power peculiarities can become general, extending even to the personnel involved. All we could learn after running up a phone bill trying to determine specific trouble was that we should have been there instead of on the phone talking about it.

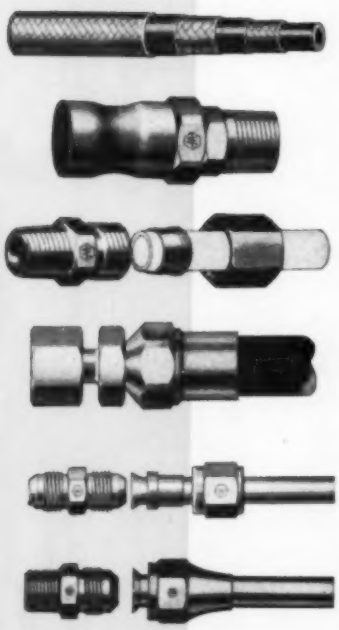
The next morning upon arrival at the scene of the trouble, we were blithely advised that everything was now working in fine shape "so go ahead tell us about the pumps, valves, adjustments etc." At such a time, years of practice in the art of dodging needless troubles goes down the drain and natural curiosity takes over. Here were happy people, satisfied that all was well; why dig into yesterday's serious problem if it isn't apparent today.

Besides curiosity, which can become acute if everyone is satisfied instead of grim, there is another motive for probing such vague trouble. If the malady should recur after you leave you will have to make another trip anyway. This could be more trouble than asking for trouble while you are on the spot.

So before going into a song and

WEATHERHEAD

. . . First in Components for Hydraulic Systems



5 TYPES OF INDUSTRIAL HOSE for low, medium, medium-high and high pressure applications; available in complete size ranges; suited for any service condition.

REUSABLE HOSE ENDS for fast assembly and positive, leakproof connections. Rugged construction that cuts costs through repeated use. Designed to insure maximum flow. Only Weatherhead gives you fittings with extra-long gripping area for dependable performance under high pressures.

ERMETO® fittings in steel and stainless steel for leakproof seals without flaring, threading or welding. Withstand shock loads, vibration and impulse at highest pressures. Ermeto connections can be uncoupled and reassembled time after time.

ERMETO REUSABLE HOSE ENDS for connecting hose assemblies directly to block; available from stock in standard sizes. Specified by major diesel manufacturers for high pressure fuel injection lines.

37° FLARED STEEL FITTINGS conform fully to J. I. C. standards. Available in all types and sizes with tube or dry seal pipe thread outlet.

BRASS FITTINGS S.A.E. 45° flare, compression, inverted flare, double compression (threaded sleeve), are machined from extruded stock, giving strength equal to forgings. Large, flat wrench pads provide easy gripping for fast assembly, even in hard-to-reach places.

WEATHERHEAD FIELD ENGINEERS are readily available to help you gain the advantages of this complete, dependable line..... Weatherhead Catalogs provide complete data on products and applications. Write: The Weatherhead Company, Dept. A-1, 128 West Washington Blvd., Fort Wayne, Indiana.

For ready reference on the complete Weatherhead line see pages 263-270 of the Master Catalog of Fluid Power Products.

WEATHERHEAD . . . LEADS THE WAY

Guarantee TOP Performance and Maximum Life!

Specify THESE TOP QUALITY FEATURES...

(Standard on Miller Cylinders at no extra cost)

Specify CASE HARDENED CHROME PLATED PISTON RODS

On all Air and Hydraulic Cylinders

Benefits To You

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. ***Available from Miller at no extra cost.***

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. ***Available from Miller at no extra cost.***

Specify "TEFLON" WIPERS

On all Air and Hydraulic Cylinders

Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from—100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. ***Available from Miller at no extra cost.***

Specify TEFLON HYDRAULIC ROD SEALS

On all Hydraulic Cylinders

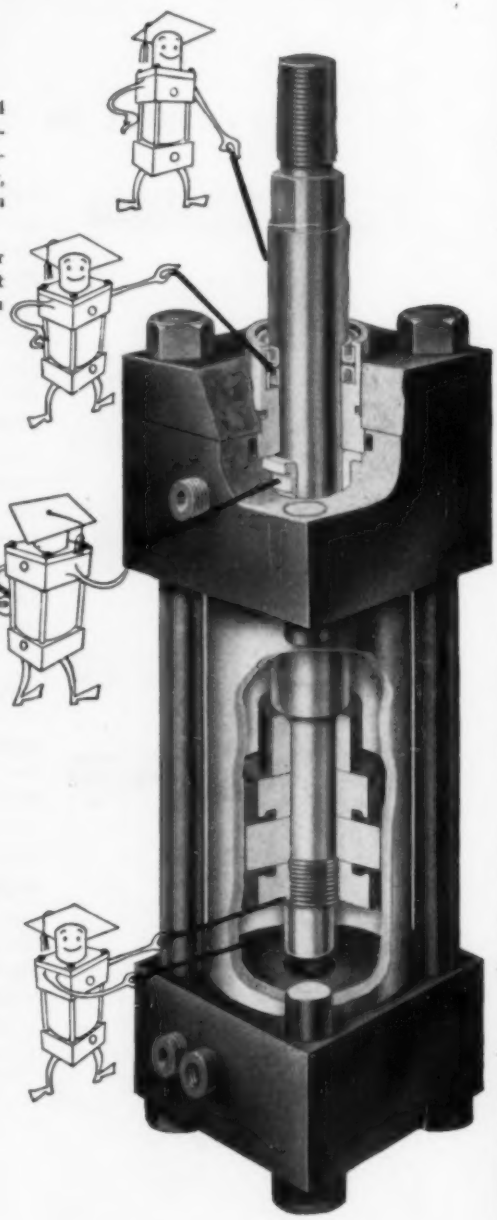
Specify RUST RESISTANT SURFACES

On all Air and Hydraulic Cylinders

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish ***at no extra cost on all Miller cylinders.*** (This finish not recommended for water service)



You may wish to route this entire page to the proper department in your company, by using this handy form. Additional copies on request. →

To (Dept.)_____

"On all our future cylinder requirements, please specify the above quality features."

Signed_____

Title_____

EFFECTIVE DATES

These new Miller features will be provided at no extra cost after January 1, 1956—and at Miller's option prior to that date.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • TOLEDO • CINCINNATI • COLUMBUS
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Miller

MILLER FLUID POWER CO.

2008 N. HAWTHORNE AVE., MELROSE PARK, ILLINOIS

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

In 1945-46 You Benefited . . .

From the following quality cylinder "Firsts" offered by Miller Fluid Power Company on its standard catalogued power cylinders:

1. Square bar steel heads, caps, and components
2. Welded fabricated steel mountings
3. Detachable, interchangeable steel mountings
4. High tensile steel tie rods (4 per cylinder)
5. High tensile steel piston rods
6. Chrome Plated Piston rods
7. Wrench flats on piston rods
8. Non-corrosive tubing on large bore air cylinders
9. Step-cut piston rings on hydraulic cylinders
10. Dirt wipers on air cylinders
11. Dirt wipers and oil wipers on hydraulic cylinders
12. Non-adjustable, bubble-tight, leakproof piston rod seals on air cylinders
13. Non-adjustable, bubble-tight, leakproof piston seals on air cylinders
14. Non-adjustable, leakproof, hydraulic piston rod seals guaranteed not to leak even one drop of oil
15. Non-adjustable, leakproof, hydraulic piston seals guaranteed not to leak even one drop of oil
16. 98% plus operating efficiency on air cylinders of 4" and larger bores at 80 psi
17. 98% plus operating efficiency on hydraulic cylinders of 4" and larger bores at 130 psi
18. 1 psi no-load break loose pressure on air cylinders of 3¼" bore and larger
19. 3 psi no-load break-loose pressure on hydraulic cylinders of 4" bore and larger
20. Seal life in excess of several hundred million feet of piston rod travel on all of the above-mentioned piston seals
21. Precision-seal cylinders
22. Seals that seal with pressure on all hydraulic static seals
23. Catalogued line of hydraulic cylinders of 2000 to 3000 psi operating pressure

In 1954 You Benefited again—from Miller's . . .

24. Sizable stock cylinder program
25. Model 77 heavy duty detachable foot mountings

In 1955 You Benefited again—from Miller's . . .

26. Greatly expanded stock cylinder program
27. Case-hardened, chrome plated piston rods
28. "Teflon" hydraulic piston rod seals
29. "Teflon" dirt wipers on air cylinders
30. "Teflon" dirt and oil wipers on hydraulic cylinders
31. High quality rust preventive finish on all parts not otherwise protected from rust on both air and hydraulic cylinders

Enter in boxes above the YEAR in which your supplier first (if at all) gave you these benefits.

In 1956, You Will Benefit Again . . .

Watch For MORE Miller Firsts!

KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE
DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • ATLANTA
TORONTO, CANADA and OTHER AREAS

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COUNTERBALANCE CYLINDERS

for best results at
lowest costs . . . specify
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Page has a complete line of Standard Synthetic Packings . . . U's, V's, Cups, Flanges and O-Rings . . . for various applications and pressures.
Write for Page Packing Catalog. Let Page quote on your requirements or help you with your packing problems. Specify Page Packings and you'll save.
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PAGE PACKINGS

Engineered to do a better job

Ideas From a Sales Engineer

Continued

dance about what this or that was and why, and how it should be adjusted, we pursued the reason for the urgency of yesterday's call. Questioning narrowed down to two persons who had been working with the system from the time it was received. Both knew that yesterday it didn't work right, but neither could explain the difficulty or define it either in terms of hydraulic or mechanical misfire.

Finally, one of them reached over, placed one hand on a part in the system and said, "All I know is that this valve didn't reverse but I found that by adjusting this one everything worked okay and that ended the trouble". That sounded like a pretty simple explanation and correction so I gave up and proceeded to narrate at length on the care, maintenance, adjustment, etc. of each element in the system.

Let me explain about this business of fluid power peculiarities though, you see the first valve he pointed out "which didn't reverse" was not even a valve. It was actually a block of steel machined to accommodate a number of flange connections. It was put into the system as a sort of manifold connector block to simplify future removal of large connections and valving for servicing. Manifold blocks don't reverse (or do they). The second valve he pointed to, which was adjusted to correct the manifold reverse, was a sequence valve on another part of the system which couldn't possibly have had any effect on the circuit which was or wasn't acting up.

What would you make of that? It might be pointed out that the two fellows did not pretend to be hydraulic maintenance men. They explained that only occasionally do they work on hydraulic systems but that they can generally manage to clear up minor problems "such as this one". A touch like that we could all use.

It reminds me of an account related some time ago by a lady friend of the family. Many years ago her father owned one of those early model cars which required a gamut of tricks to keep it in op-

eration. When she was allowed to drive by herself she tried to apply some of the old man's tricks to keep the car going to her destination. She had seen him, on occasions when it stalled, tap the carburetor or adjacent parts with a hammer, and magically it seemed to take off again. Thus, when it konked out on her, she grabbed the hammer from the tool box, whacked in the vicinity of the carburetor for awhile, closed the hood, replaced the hammer, wiped her hands and started off. She thought she had mastered the old man's art, but before long it died again. She repeated the procedure a couple of times, probably beating a little harder each time, until she couldn't pound anymore life into it. The garage mechanic who came out to locate the trouble found that she had been driving with the emergency brake set and each time the brake bands heated the engine stalled. He towed the car to the garage, replaced the battered carburetor, instructed her in the operation and release of the emergency brake and got her back on the road.

Obviously particles of dirt would accumulate and choke off the gas and the old boy knew how to jog them loose, either to go on through or drop back in the line for future plugging. A similar situation no doubt existed on the hydraulic system mentioned previously. Either a piece of foreign material jammed a valve or a strain was set up in the connections which caused a valve spool to bind temporarily. While these guys were working over the unit adjusting here and there the valve spool probably worked loose and stayed free.

We have seen the trick of raping hydraulic valves, to free them, developed to a point where it is the first procedure followed on trouble shooting. In one plant we noticed that the corners of the valve castings were decidedly upset from repeated rapping, and it was explained that whenever a failure occurs the maintenance man uses his hammer first and his head afterward. This contributes to the volume of replacement business upon which all manufacturers, large and small, are more or less dependent. ▼▼▼

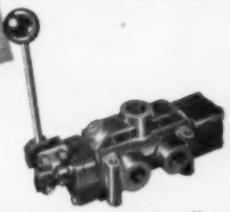
ADEL *Industrial Hydraulic Equipment*

for PEAK PERFORMANCE ADEL Hydraulic Valves and Pumps are setting new and ever higher standards for precision in manufacturing and efficient performance in operation. Following are but a few of the wide variety of models to meet all operating conditions.

GEAR-TYPE HYDRAULIC PUMPS

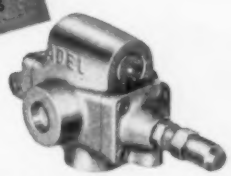
For 1000 psi service with rated capacities at 1800 rpm of from 1.5 to 46.8 gpm.

DIRECTIONAL CONTROL VALVES



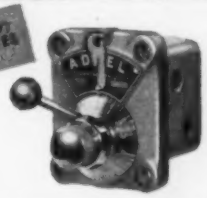
4-way valves with spring-centered, spring-offset, and 1, 2, or 3 position detent action. 1500 psi. Flows to 28 gpm.

BY-PASS VALVES



Relief, Sequence and Unloading valves. Direct or remote operation, 50 to 1500 psi range.

VOLUME (FLOW) CONTROL VALVES

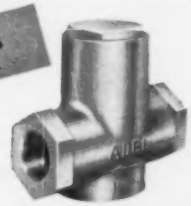


Compensated type maintains constant flow over wide differential pressure range. No drain line required. 1500 psi.

PILOT VALVES

2 or 3 position detent. With or without dog or lever. Can be used as 4-way valve in small circuits. 1000 psi.

CHECK VALVES



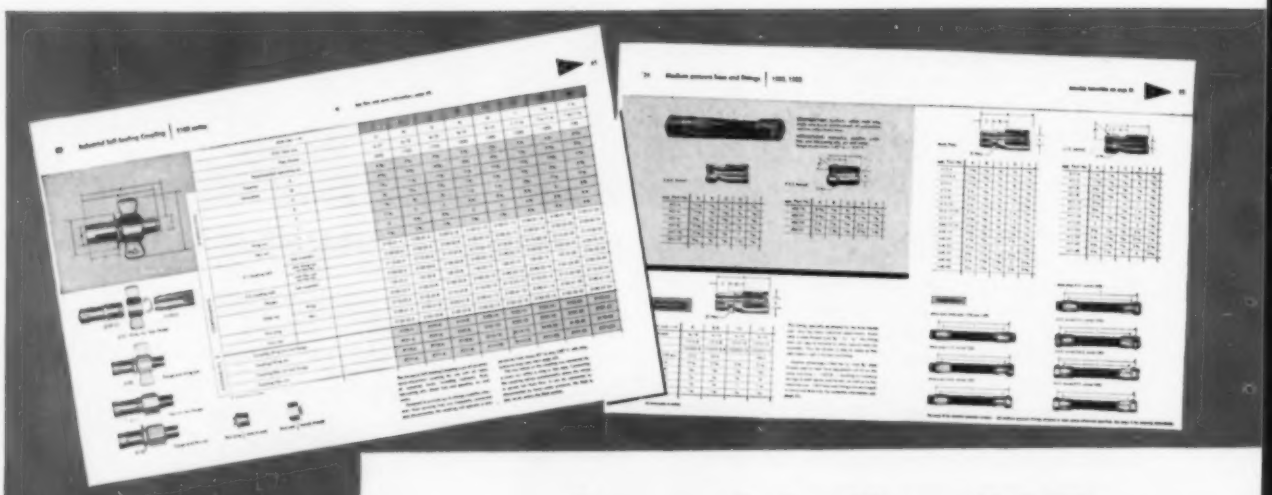
Valves allow free flow in one direction only. Many variations available. 3000 psi.

For complete engineering specifications and counsel, Address: ADEL PRECISION PRODUCTS, DIVISION OF GENERAL METALS CORPORATION, 10771 Van Owen Street, Burbank, California.

ADEL PRECISION PRODUCTS
A DIVISION OF GENERAL METALS CORPORATION

Manufacturers of Industrial Hydraulic Valves and Pumps

DISTRIBUTORS: AIR-DRAULIC EQUIPMENT CO., HOUSTON, TEX. • AIR & HYDRAULIC ENGINEERING CO., NEW HAVEN, CONN. • RUSS CHAMBERLIN COMPANY, PORTLAND 14, ORE. J. BOYD COATES, GLENSIDE, PA. • CORBY SUPPLY COMPANY, ST. LOUIS, MO. • FRANK T. DONNELLY COMPANY, PITTSBURGH 38, PA. • HASKEL ENGINEERING & SUPPLY CO., GLENDALE 4, CALIF. • HASKEL ENGINEERING & SUPPLY CO., SAN FRANCISCO 7, CALIF. • AIR-DRAULICS COMPANY, PHOENIX, ARIZ. • INDUSTRIAL AIR & HYDRAULIC EQUIP. CO., DETROIT 15, MICH. LINCOLN SUPPLY COMPANY, PROVIDENCE, R. I. • L. H. MONSEES, INDEPENDENCE, MO. • THE NEFF ENGINEERING CO., FORT WAYNE 3, IND. • POWER DRIVES, INCORPORATED, BUFFALO, N. Y. • SCOIT EQUIPMENT & ENGINEERING CO., DAYTON 10, OHIO • ROBERT TAYLOR & SONS, SALT LAKE CITY 10, UTAH • WYATT SALES COMPANY, CLEVELAND 15, OHIO TRI-STATE SUPPLY COMPANY, BROOKLYN 33, N. Y.



Aeroquip's New 64-Page

EACH SECTION CONTAINS HELPFUL INFORMATION!

SECTION A contains the following engineering data and equipment:

- products and services
- ordering instructions
- hose fluid reference chart
- planning of hose installations
- bend radius vs. operating pressures
- vacuum data
- thread interchange data
- bulkhead hole size data
- hand tools
- support clamps
- hose cover stripping tool
- hose cut-off machine
- hose assembly machines
- hydrauliscope

SECTION B contains the following hose, fittings and adapters:

- low, medium, high and very high pressure hose lines
- air brake hose
- coal shooting hose
- grease hose
- ammonia hose
- LPG hose
- steam hose
- trichlorethylene hose
- diesel fuel hose
- Freon hose
- hot water hose
- low temperature hose
- electrically non-conductive hose
- fire-resistant hose
- S.A.E., J.I.C., Parker, and Union adapters
- assembly combinations chart
- assembly instructions
- kits

SECTION C contains the following special fittings:

- flange type, split flange type and Globe Seal fittings.

SECTION D contains the following Self-Sealing Couplings:

- industrial and farm Self-Sealing Couplings, and farm Breakaway Coupling.

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Aeroquip Corporation, Jackson, Michigan

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Please send me the new, illustrated Aeroquip catalog checked at the right.

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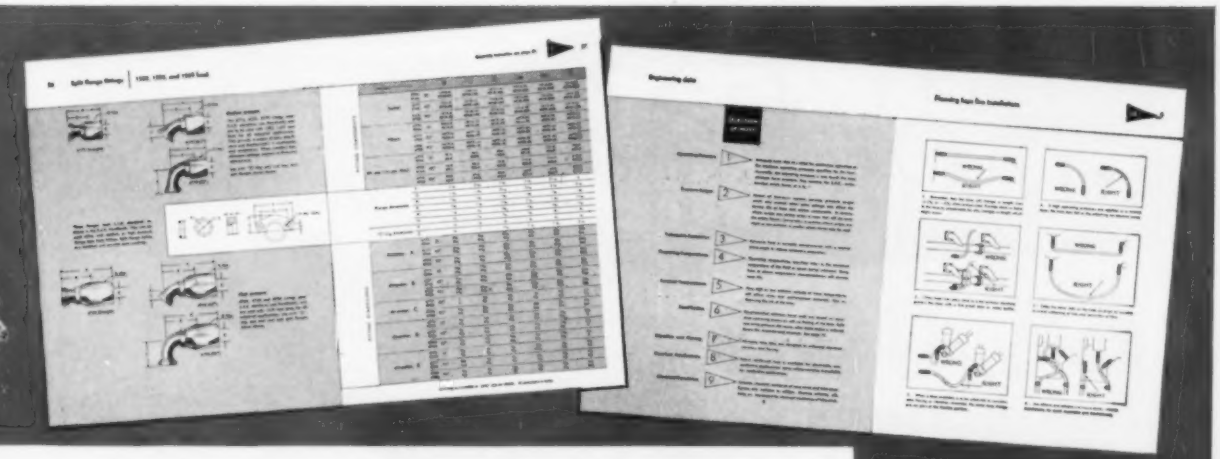


Industrial Catalog Is Ready!

YOU'VE NEVER SEEN A HOSE LINE AND COUPLING CATALOG THAT IS SO COMPLETE . . . SO EASY TO USE . . . SO PACKED WITH HELPFUL INFORMATION!

Whether you design machine tools, trucks, construction equipment, engines, farm equipment, or any of hundreds of industrial products, this new Aeroquip catalog will save you hours of time . . . provide answers to knotty fluid line problems.

The full range of products covered includes hose, fittings and couplings for everything from low to extra high pressure systems . . . for carrying hydraulic fluid, air, grease, oils, ammonia, LPG, steam, diesel fuel, Freon, water and many other fluids. You will also find valuable reference to help you in the planning, engineering, and installation of fluid-carrying systems.

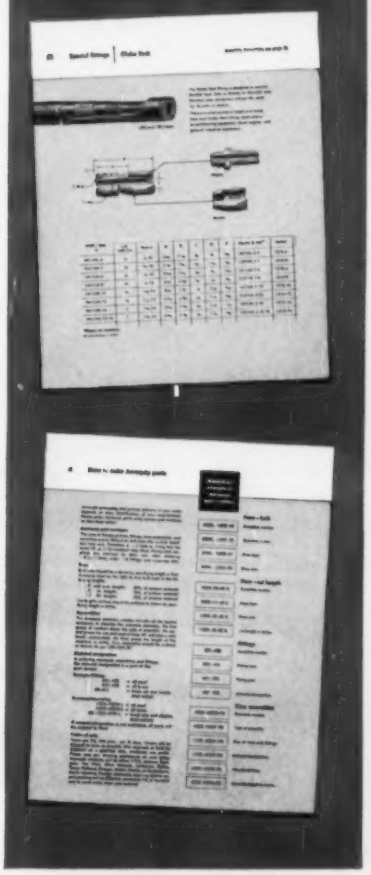
Aeroquip's new, fully illustrated catalog No. 200 is designed to be easily read and exceptionally easy to use. Be sure to get your copy. Fill in and mail the handy coupon today!

ALSO AVAILABLE! TWO OTHER NEW AEROQUIP FLEXIBLE HOSE LINE AND COUPLING CATALOGS

Catalog No. 100 covering aircraft products.....(78 pages).

Catalog No. 300 covering marine products.....(40 pages).

Please check box in coupon for catalog desired.



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Aeroquip

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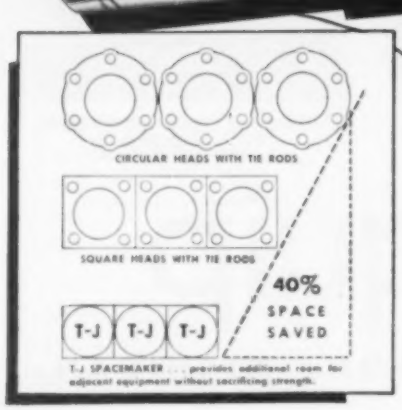
AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

DELIVERY OFF THE SHELF©

IN 64,000 COMBINATIONS


CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
40% SPACE SAVED
T-J
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T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

T-J Spacemaker CYLINDERS

OUTMODE ALL OTHERS . . . SAVE 40% SPACE!

You'll never go back to tie-rod cylinders, once you apply T-J Spacemakers to your push-pull-lift jobs! Advantages in space saved, weight saved, greater strength and off-the-shelf delivery are among the dozens of Extras you get as Standard!

Now — these sensationally popular T-J Spacemaker Cylinders are available off the shelf *in sizes up to 8″*. This means as many as 64,000 different combinations of styles, bores, strokes, mountings, etc. *immediately available!* Oil pressure to 750—Air to 200 P.S.I. Super Cushion Flexible Seals for Air . . . New Self-Aligning Master Oil Cushion. Hard chrome plated bodies and piston rods (Standard). Only from T-J can you get these new ingenious cushion designs! Send for bulletin SM-155-2. The Tomkins-Johnson Co., Jackson, Mich.

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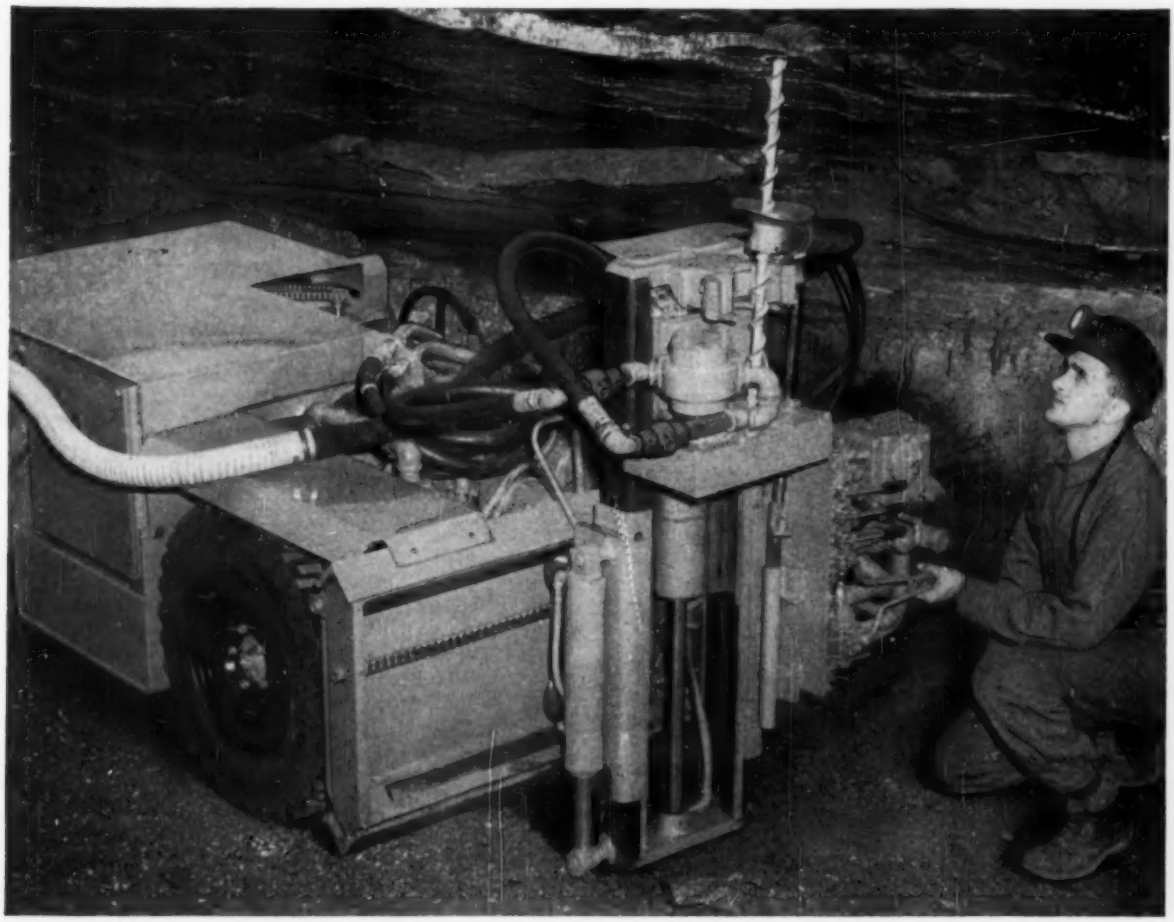
Member of the National Fluid Power Association

T-J TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

FLETCHER MINING EQUIPMENT REPORTS ON CHIKSAN SWIVEL JOINTS



LONG, SERVICE-FREE LIFE DESPITE EXTREME ABRASIVE DUST AND MECHANICAL ABUSE

When it comes to rugged service, the Fletcher Roof Drill really puts Chiksan Swivel Joints thru the paces. Installed on hydraulic lines where operating pressures run as high as 1800 psi, the Swivel Joints are used to minimize torque and eliminate knotting on lines as the bit is raised and turned. The Swivel Joints are subjected to extreme mechanical abuse and abrasive dust as the hard working drill bores a hole, then installs and tightens roof bolts in underground mines.

Yet with all of the extreme abuse and abrasive coating, the J. H. Fletcher Company reports Chiksan Swivel Joints continue to provide free swiveling action with exceptional maintenance-free service.

Assure yourself of this long-life, trouble-free service, by specifying versatile Chiksan Swivel Joints in your plant and equipment.

Chiksan Swivel Joints rotate 360° in 1, 2, and 3 planes, handling air, hydraulics, fuels, oils, water and other fluids.

CHIKSAN

fmc

FOR FREE CATALOG WRITE DEPT. 151

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

CHIKSAN COMPANY, Brea, California • Newark 2, New Jersey • Well Equipment Mfg. Corp., (Division), Houston 1, Texas • Chiksan Export Co., Brea, Calif.; Newark 2, New Jersey • Chiksan of Canada, Ltd., Edmonton, Alta.

Useful Literature

For your free copy of publications reviewed, fill in the reader service card

HYDRAULIC VALVES . . . for aircraft, industrial, and mobile applications are featured in Bulletin 101 prepared by Electrol, Inc. The bulletin presents a timing valve, speed control valve, pressure relief valve, cut out valve, check valves, and various directional control valves. A dual thermal relief valve designed to relieve the pressures built up by thermal expansion in hydraulic system is presented. A timing valve which regulates the operation of component units in a system at a specific time is also described.

Circle 241 on Reader Service Card

COUPLERS . . . Tru-Flate, Inc. has issued four charts indicating flow characteristics of their couplers Nos. 60C, 60F, and 60G. The charts indicate flow of air through the couplers at various pressures and pressure drops at various flows for both air and oil. The charts are intended for engineering personnel in selecting the couplings and are of considerable assistance when installing two-way flow couplers.

Circle 242 on Reader Service Card

ELECTRIC MOTORS . . . manufactured by Howell Electric Motors Co. are featured in an attractive booklet designated N-100-R. The Series 100 motors presented are smaller, lighter, and cooler running, and short descriptions show the advances in design that have been built into these re-rated motors. Both totally-enclosed, fan-cooled and open drip-proof types of integral horsepower motors are detailed, with other enclosures and mounting variations covered. Construction features are clearly illustrated, as well as features incorporated in manufacture. A chart of dimensions is included.

Circle 243 on Reader Service Card

AIR PUMPS . . . Bulletins Nos. A-1683 and A-1399 have been prepared by The Kraissl Co. to specify their class 21 and Class 23 series units. The Class 21 series mechanism makes use of rollers carried in the recesses of the rotary piston. Under operating conditions the rollers emerge by centrifugal force and follow the inside periphery of the housing. The Class 23 series which is for the elimination of oil lubrication from air pumps are dry lubricated. The displacement blades furnish their own lubrication and take up their own wear. In addition to application and design information, sizes and dimensions and operating instructions are given for the pumps.

Circle 244 on Reader Service Card

TIMERS . . . A. W. Haydon Co. has issued a new catalog covering their line of time delay relays, repeat cycle timers, counters, and other timing devices. The catalog includes photographs of each type giving design features and specifications. Principles of operation are shown in schematic diagrams, and typical circuit applications are given. Units for aircraft as well as industrial applications are included, and information is given to assist in selecting the proper unit. Enclosures for pressure sealing and hermetic sealing are shown.

Circle 245 on Reader Service Card

PACKING . . . for pistons is the subject of a 16-page comprehensive data bulletin published by Darling Valve & Mfg. Co. The bulletin, No. 5503, includes operating diagrams and a list of typical installations for the cup-type piston packing. Typical installations are shown and helpful data is given on available for specified pressure, temperature, and corrosive conditions. Also included are tables giving the complete range of standard sizes and prices. The bulletin explains operation and installation of the cup-type packing and indicates its advantages.

Circle 246 on Reader Service Card

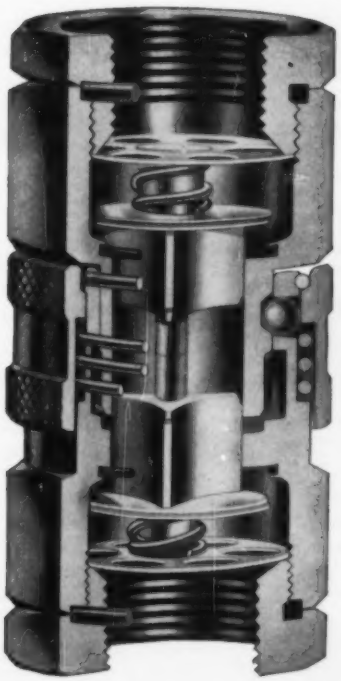
VALVES AND CYLINDERS . . . manufactured by Rotex Punch Co., Inc. are described in literature recently issued by the company. One brochure specifies cylinders for air, water, and low pressure hydraulic service. These range from 1⅛ to 4-inch bores and incorporate O-ring sealing throughout. The valves are presented in Bulletin No. 203-A which indicates dimensions and various actuating devices. One general body design is used for all valve assemblies permitting the use of many different actuating attachments on either end of the valve. A third leaflet presents a single acting clamping cylinder with a 1-inch stroke and 1⅛-inch bore, and a clamp type cylinder incorporating a valve in the cylinder body.

Circle 247 on Reader Service Card

For more reviews of FREE LITERATURE turn to page 214

DISCONNECTED IN 1 SECOND

and NO DANGEROUS SPRAY



INSTALL SNAP-TITE "H" COUPLINGS:

- Snap-Tite "H" Series couplings are constructed so that the valve is completely closed in coupler before disengaging the nipple seal, eliminating fluid spray, and the only loss of fluid is the few drops in the nipple cavity.
- Powerful springs keep valves shut tight when "H" couplings are disconnected.

Check your couplings. Are they creating accident hazards and losing costly fluids? Are offensive odors and flammable gases escaping from them?

SNAP-TITE'S "H" COUPLING, SIZE FOR SIZE, IS THE SMALLEST COUPLING WITH HIGHEST STRENGTH AND HIGHER EFFICIENCY

Recessed valve washers . . . fluted valve stems . . . valve stops with minimum flow restrictions . . . large inside diameter—these combine to allow maximum flow capacity with lowest pressure drop.

Available in sizes ⅛" to 10" in alloy steel or to specifications

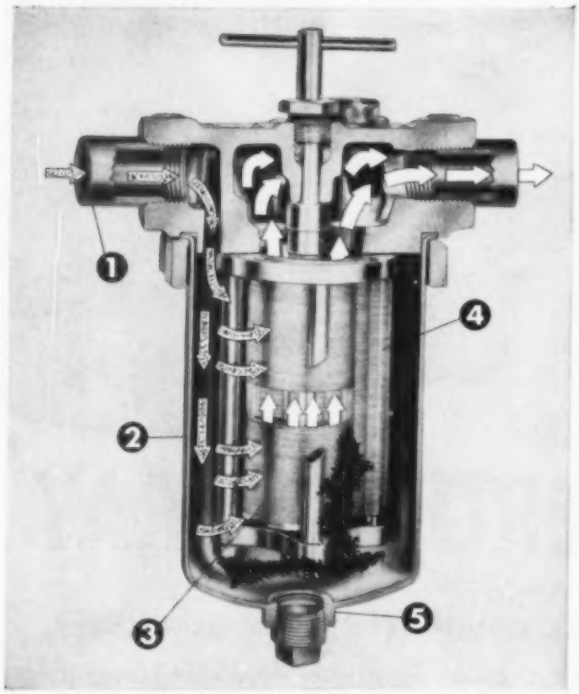
SNAP-TITE COUPLINGS CAN HANDLE ALMOST ANYTHING THAT FLOWS

See the Snap-Tite representative in your city or write for Bulletin 240A

Snap-tite, INC.
UNION CITY 1, PENNSYLVANIA

NOW! 40-micron, self-cleaning filter

It's the new Cuno SUPER Auto-Klean



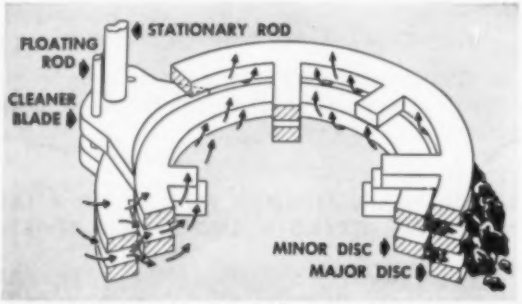
HOW IT WORKS. Dirty oil enters inlet (1) at left, fills housing (2) and flows through metal edge-type filter (3). Clean oil rises through center of filter, leaves at right. Dirt combed out by cleaner blades (4) is removed through drain (5).

Cuno's new SUPER Auto-Klean is the first practical, compact micronic filter for lubricating oil, hydraulic fluid, coolant, fuel, and other industrial fluids.

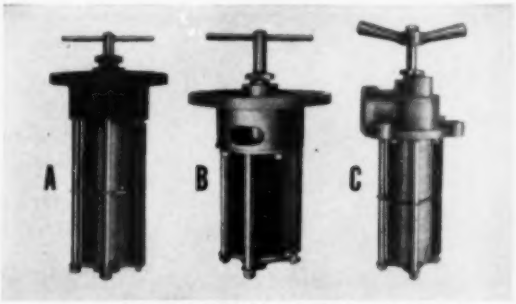
Many times smaller than other micronic filters of equal capacity, Cuno's new SUPER Auto-Klean filter now makes possible economical, micronic filtration at high flow rates and eliminates the need for replacement cartridges in most cases. Here's what it offers:

1. **Full-flow** 40-micron filtration with a self-cleaning filter. Positive protection against particles larger than 40 microns (actually 0.0015 in.). All-metal filter can't rupture or channel.
2. **Easy cleaning.** Just turn the handle—by hand or continuously with motor drive. No interruptions for cleaning.
3. **No cartridge changes.** Ends operating costs if you've been using cartridge filters.
4. **Low pressure drop, no pressure drop build-up.** An 8" by 2¼" SUPER Auto-Klean filters 30 gpm of 200 SSU oil with only 3 psi pressure drop—up to 75% more with slightly higher pressure.
5. **High capacity in a small package.** Many times smaller than replaceable-cartridge type filters of equal capacity, it saves with lower initial costs, lower installation costs.
6. **Easy to build into new equipment.** Available for line-type housings *(left)* or incorporation in sump or reservoir *(below.)* Works in any position.
7. **Easy to install in old equipment.** Fits existing Auto-Klean housings. You can easily replace most 2¼" diameter elements with SUPER Auto-Klean for finer filtration.

Write today for complete technical data on the new SUPER Auto-Klean for your new or existing equipment. Ask for Catalog No. SAK-057. Cuno Engineering Corporation, 2-1 South Vine Street, Meriden, Connecticut. 59



FILTER ELEMENT consists of stacked major and minor discs and cleaner blade bearing against minor discs. Small arrows show flow. Short restrictions between minor and major discs stop 40-micron particles but allow high flow rate.



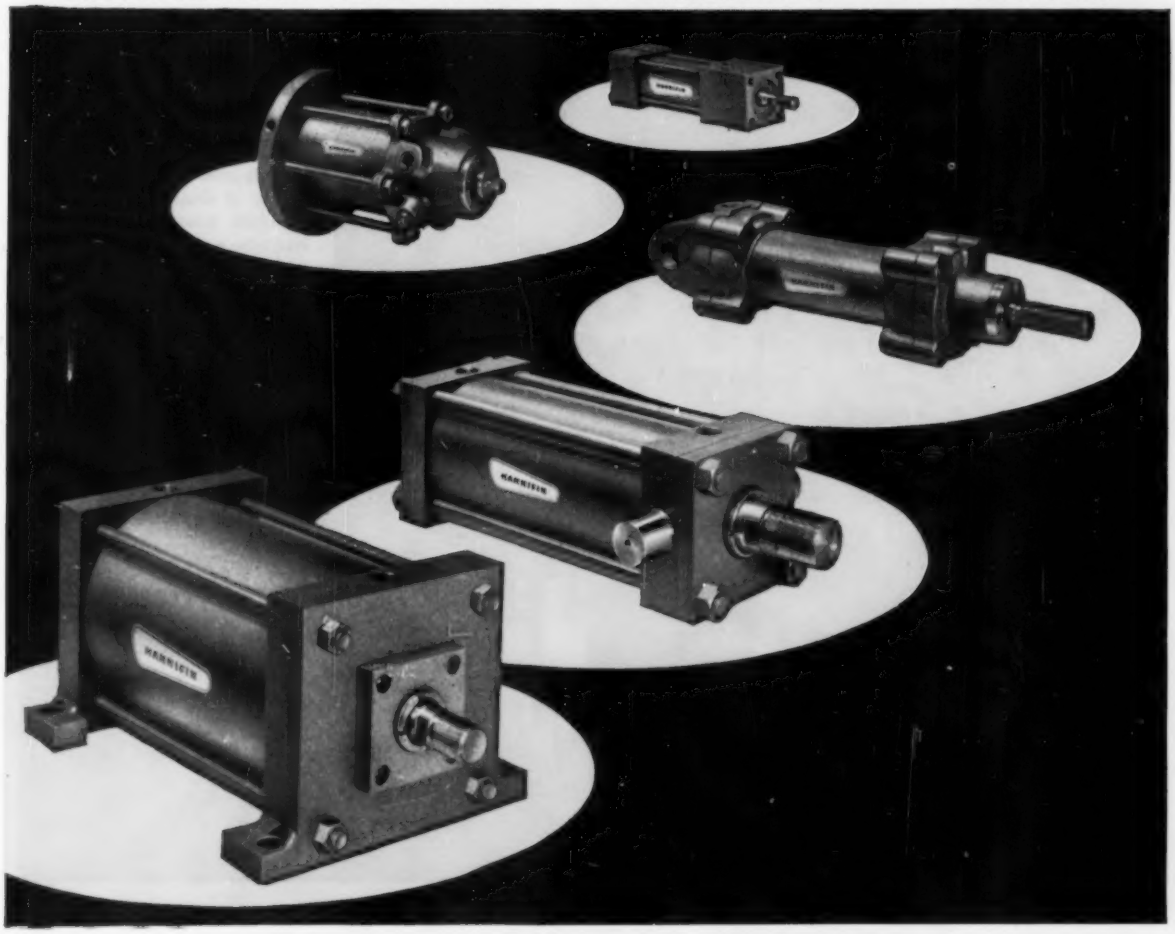
FILTERS FOR INTERNAL PIPING *(A and B above)* allow streamlined design plus the best infiltration. Flange mounting with external outlet *(C above)* and line-type *(large cutaway above left)* are just a few of many other possibilities.

CUNO **ENGINEERED FILTRATION**

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (edge-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound) • PORO-KLEAN (porous metal)

HANNIFIN AIR AND HYDRAULIC CYLINDERS



To the engineer who wants the best cylinder—in a hurry

In the selection and purchase of cylinders look for:

Completeness of Line. Hannifin makes *five* lines of air and hydraulic cylinders in a range of bore sizes and mounting styles to meet every requirement and preference.

Leadership in Design. Hannifin cylinders are built to exacting quality standards and extremely close tolerances to insure easy, accurate mounting. Hannifin has also introduced the *externally removable* and replaceable bronze gland cartridge, the most noteworthy improvement in cylinder design in the last 50 years.

Rapid Delivery. Hannifin can ship the cylinder you need in strokes up to 60" *in any normal quantity within 48 hours.*

Field Engineers, located in all principal cities, are as near as your telephone. Or, if your requirements are really urgent, call us at Des Plaines. Experienced sales engineers will handle your order.

HANNIFIN

MAIL THIS COUPON FOR PROMPT ACTION

- ☐ Have Field Engineer call at once
- ☐ Have Field Engineer stop by soon
- ☐ For the present, just send complete catalog information on Hannifin cylinders including prices

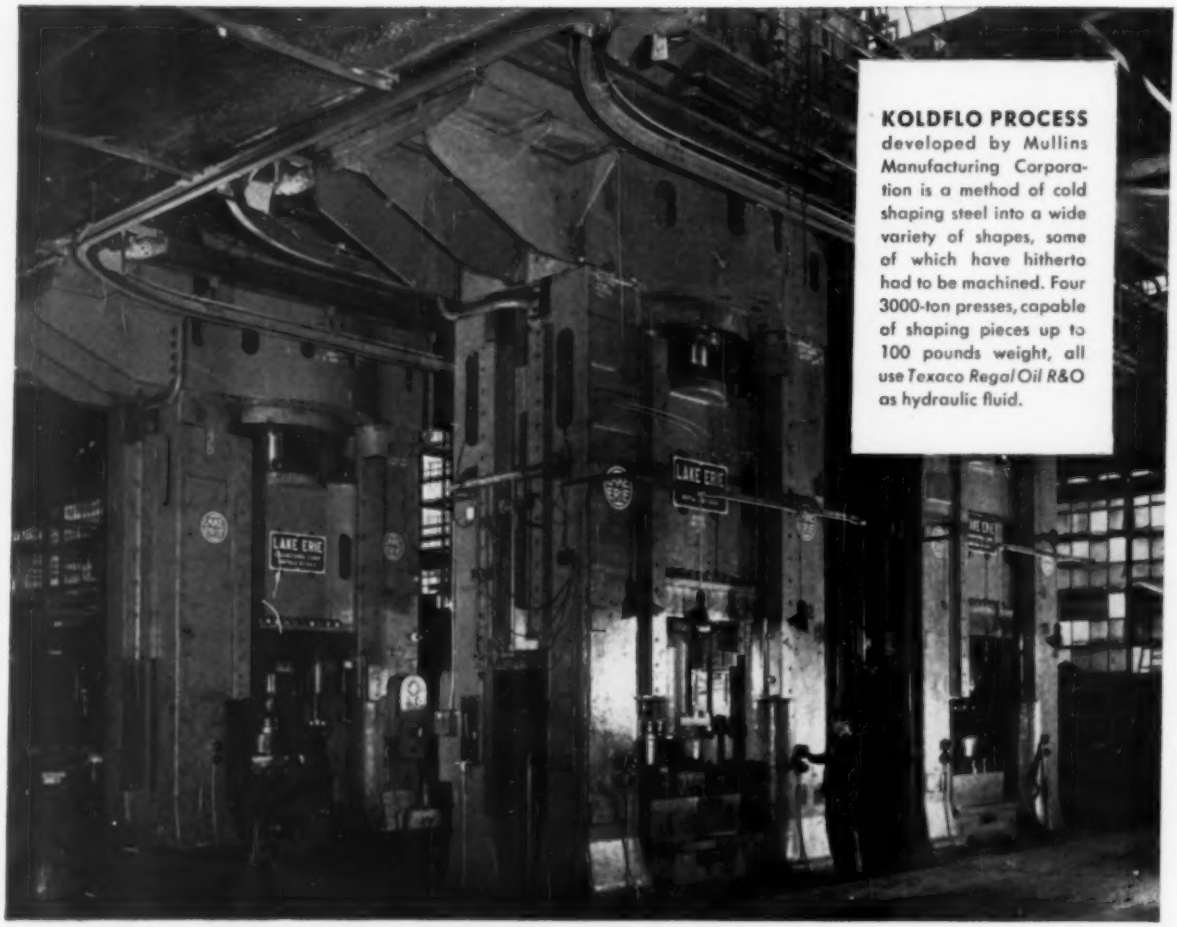
Hannifin Corporation, 545 S. Wolf Rd., Des Plaines, Ill.

Name.....*Title*.....

Company.....

Address.....

City.....*Zone*.....*State*.....



KOLDFLO PROCESS developed by Mullins Manufacturing Corporation is a method of cold shaping steel into a wide variety of shapes, some of which have hitherto had to be machined. Four 3000-ton presses, capable of shaping pieces up to 100 pounds weight, all use *Texaco Regal Oil R&O* as hydraulic fluid.

"Systems completely free of sludge, rust and foam"

—reports Mullins Manufacturing Corporation, Warren, Ohio

FOUR 3000-ton Lake Erie presses went into service in 1953 with an initial fill of *Texaco Regal Oil R&O* – 2700 gallons in each system. Now, two years later, Mullins tells us –

> **"Your Texaco Regal Oil R&O has done a great job in assuring the dependable hydraulic performance we must have. All systems are completely free of sludge, rust and foam. Very little make-up has been required."**

Texaco Regal Oil R&O has been proved by test to have *ten times the oxidation resistance* of ordinary turbine-quality oils – far greater ability to keep systems free from sludge, rust and foam. And there is a complete line of *Texaco Regal Oils R&O* to meet the requirements of all types and sizes of hydraulic equipment, all operating conditions.

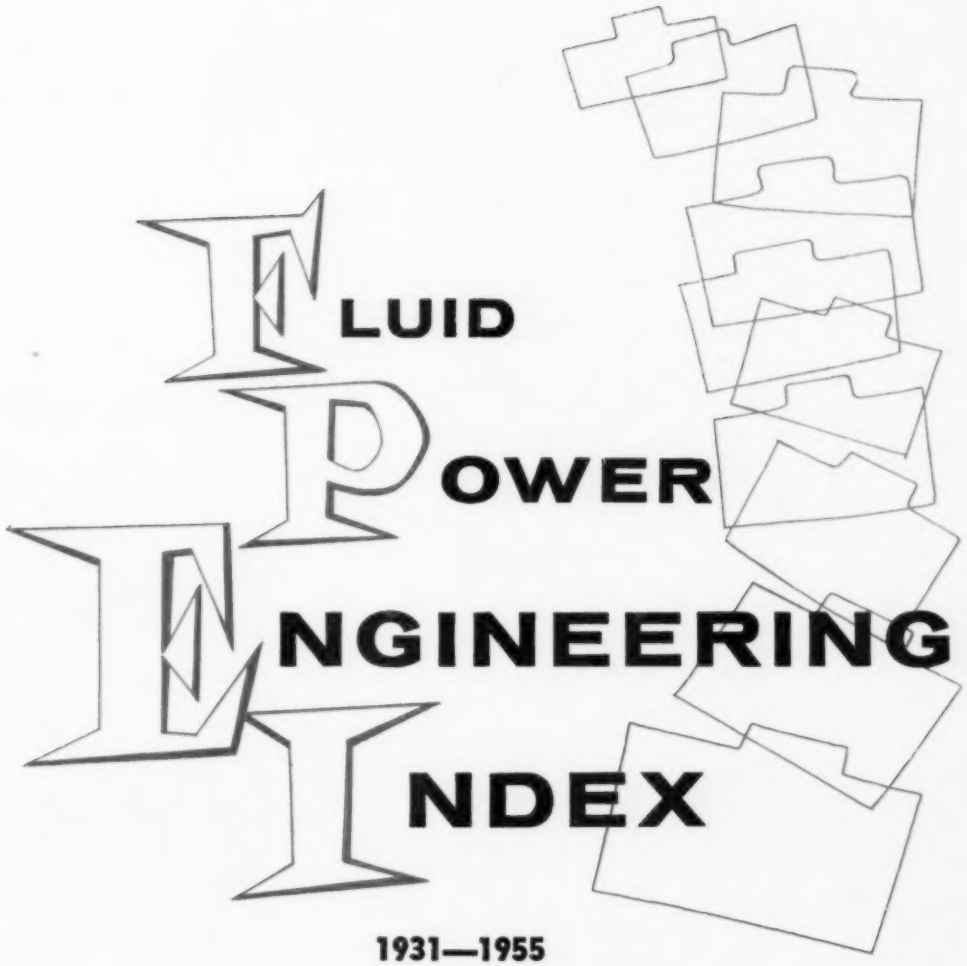
Let a Texaco Lubrication Engineer help you select the proper one to keep *your* hydraulics trouble-free. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL HYDRAULIC UNITS

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

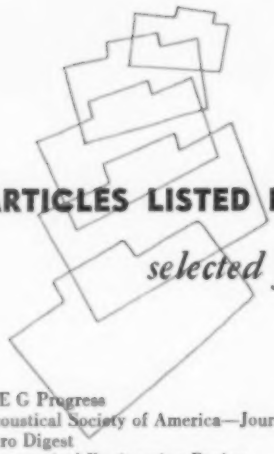


ABOUT THIS INDEX . . .

Twenty-five years of published material are represented by this index which has been prepared to help you obtain information about the many phases of the fluid power field.

Only the material which has a direct bearing on the fluid power field has been listed, and the classifications have been selected to cover theory, design, applications, and maintenance. Because many of the articles and books cover several of the classifications, you will find these listed wherever applicable. In these cases, an explanation of the article is included only with the listing under the most pertinent classification. Items are listed chronologically under each classification. The classification index should be consulted carefully to determine the correct classification under which to search for a particular subject.

Material from both British and American publishers has been included, and almost all of it is available from public libraries. The editors of APPLIED HYDRAULICS wish to acknowledge the help received from the librarians and facilities of the Technology Section of the Cleveland Public Library.



ARTICLES LISTED IN THIS INDEX *have been selected from the following publications:*

A E G Progress
Acoustical Society of America—Journal
Aero Digest
Aeronautical Engineering Review
Aeronautical Quarterly
Aeroplane
Agricultural Engineering
Aircraft Engineering
Aircraft Production
Allis-Chalmers Electrical Review
American Builder
American Ceramic Society—Bulletin
American Foundryman
American Institute of Electrical Engineers—Transactions
American Institute of Mining and Metallurgical Engineers
American Machinist
American Society for Testing Materials—Bulletin
American Society of Mechanical Engineers—Papers, Transactions
American Society of Naval Engineers—Journal
American Society of Tool Engineers—Journal
American Standards Association—Standards
Applied Hydraulics
Applied Mechanics Reviews
Automation
Automobile Engineer
Automotive & Aviation Industries
Automotive Industries
Aviation
Aviation Industries
Aviation Week
Blast Furnace & Steel Plant
Boiler Maker & Plate Fabricator
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Institute of Engineers, India Reports
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Institution of Electrical Engineers—Proceedings
Institution of Engineers & Shipbuilders in Scotland—Transactions
Institution of Marine Engineers—Transactions
Institution of Mechanical Engineers—Proceedings, Papers
Institution of Production Engineers Journal
Instrument Society of America—Journal
Instruments
Iron Age
Iron & Coal Trades Review
Iron & Steel Engineer
Iron & Steel Institution—Journal
Journal of Aeronautical Sciences
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Junior Institution of Engineers—Journal
Light Metals
Lubrication
Lubrication Engineering
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Machine Design
Machinery (London Edition, New York Edition)
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Machinery & Steel World
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Mining Congress Journal
Mining Journal
Minneapolis University St. Anthony Falls Hydraulic Laboratory—Project Reports
Modern Plastics
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Motorship
National Advisory Committee on Aeronautics-Reports, Technical Memos
National Conference on Industrial Hydraulics (NCIH)—Proceedings
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National Safety News
Nautical Gazette
New Zealand Engineering
Oil Engine
Oil Engine & Gas Turbine
Oil & Gas Journal

Oil Weekly
Pacific Marine Review
Packaging Review
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Pit & Quarry
Plant Engineering
Power
Power Engineering
Power Generation
Power House (Management)
Power Plant Engineering
Power & Works Engineer
Precision Metal Molding
Product Engineering
Product Engineering Annual Handbook of Product Design
Purchasing
Railway Gazette
Railway Mechanical Engineer
Railway Track & Journal
Roads & Bridges
Roads & Road Construction
Roads & Streets
Rock Products
Royal Aeronautical Society—Journal
Rubber Age
Science Lubrication
Sheet Metal Industries
Sheet Metal Worker
Shell Aviation News
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Shipbuilding & Shipping Record
Silk Journal & Rayon World
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Society of Engineers Journal & Transactions
Society of Plastics Engineers—Journal
South African Institution of Mechanical Engineers—Journal
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Sperryscope
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Steel Processing
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Sulzer Technical Review
Surveyor
Technical Data Digest
Textile Recorder
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Times Trade & Engineering Supplement
Tool & Die Journal
Tool Engineer
Tooling & Production
U. S. Bureau of Mines—Report Investigations, Information Circulars
U. S. Bureau of Standards—Simplified Practice Recommendations
U. S. Civil Aeronautics Administration—Technical Development Reports
Utilization
Veneers & Plywood
Wastes Engineering
Water Works Engineer
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Western Flying
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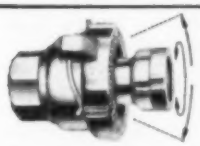

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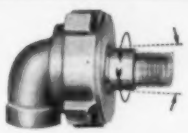

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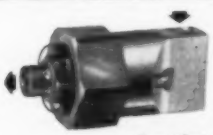

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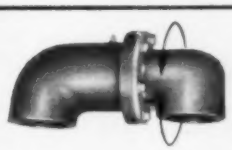

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1931-1955

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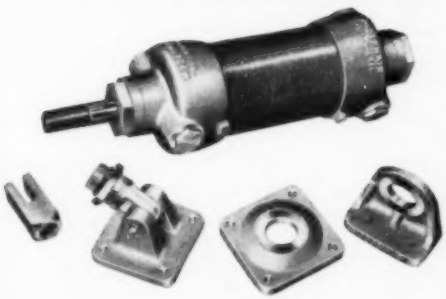

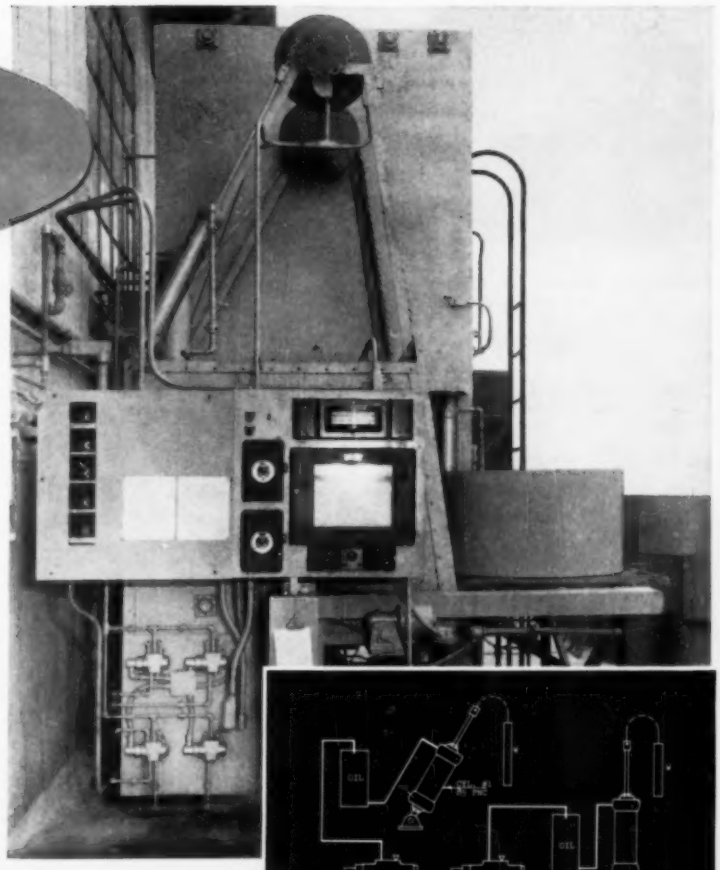

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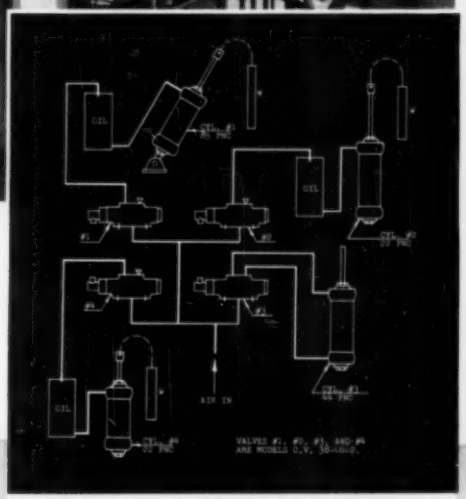

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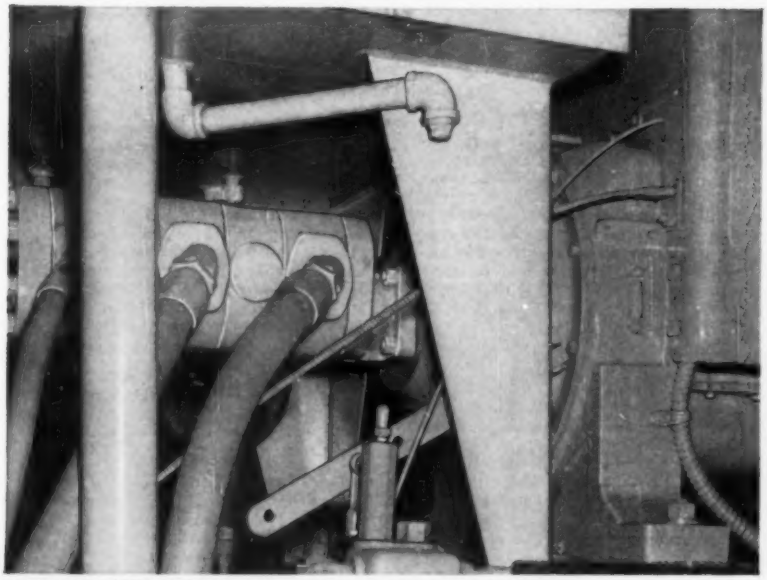
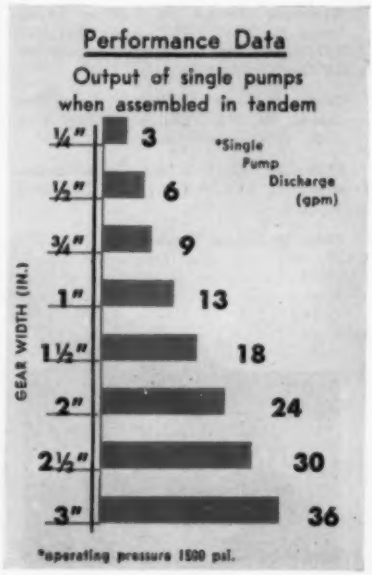
FLUID POWER NEWS

THREE PUMPS— ONE POWER TAKE-OFF





COMPACT TANDEM MOUNTING driven thru one power take-off. Three power packed hydraulic circuits operate independently from the output of these three single pumps.

How complicated engineering problems are solved in designing hydraulically powered, multi-functional heavy duty equipment.

More manufacturers adopting tandem oil hydraulic pumps to turn out more work with less operator fatigue.

If you have problems in designing hydraulic circuiting into your hydraulic powered equipment because of its multi-functional operation, look how the "Commercial" tandem oil hydraulic pump will give you the necessary output to energize more than one cylinder or motor independently of each other at substantial savings in cost.

Independent control of snow plow blade and wings, earth mover boom and tool, conveyor and spinners of ice control spreaders, or tool operation on power steered mobile equipment are merely a few applications where these pumps deliver fluid power to every separate hydraulic circuit required for all these functions. Each operation is individually controlled, yet when speed change is needed for better intermittent tool operation, the combined output of two or more pumps can be easily obtained with simple valving. You do not have to over-power your entire circuit in order to satisfy an intermittent overload developed in any part.

TOUGH DIGGING in close quarters with this multi-purpose machine is only possible because of its finger-tip controlled hydraulic operation. *KM-74*

Two, three, or even as many as four pumps, assembled with parts common to single pumps, can be strung out behind one shaft—the whole assembly requiring only one mounting. How much more complicated it would be to mount individual single pumps, each requiring a separate power take-off, for every hydraulic operation. Think how much less space one tandem would occupy, and can't you readily visualize how simplified your piping and valving problems become.

Yes, if you have multiple hydraulic circuiting to design into your equipment, you will do well to further investigate the many advantages the "Commercial Tandem" has to offer. Our engineers, who have been through it many times before, will be available to help you. *The Commercial Shearing and Stamping Company, Youngstown, Ohio; Chicago, Illinois; Salt Lake City, Utah.*

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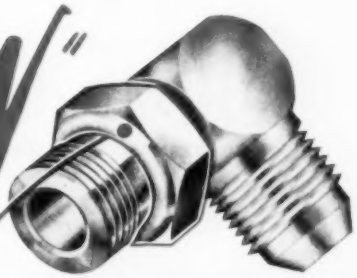

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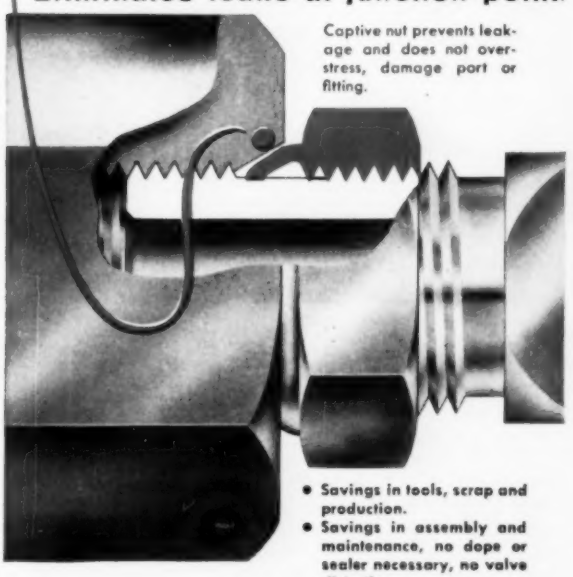

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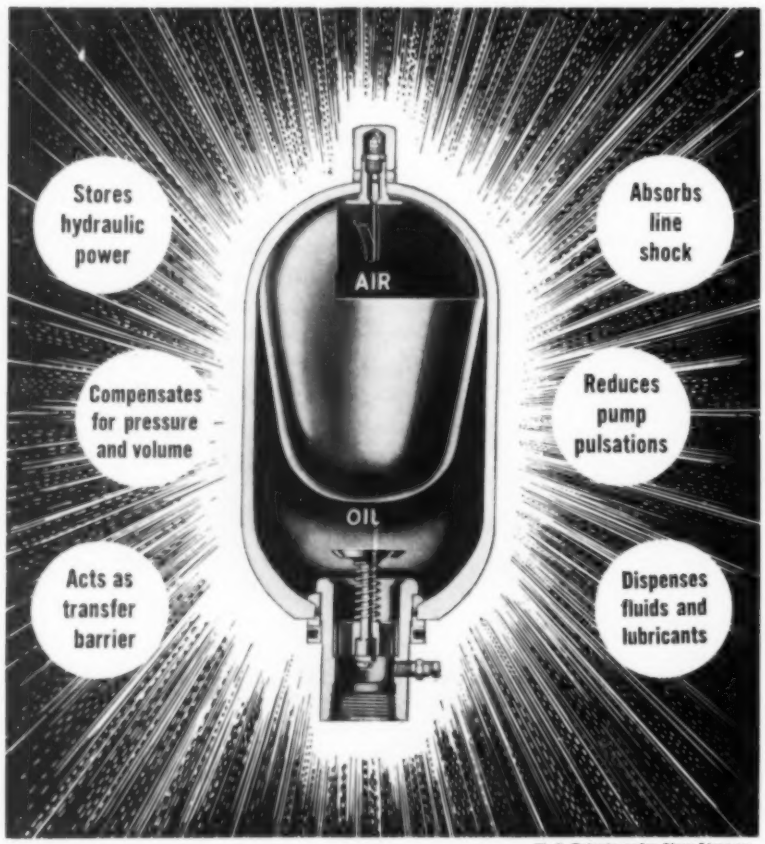

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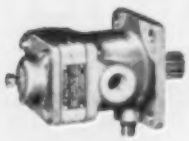
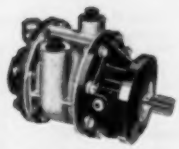
Engine driven fuel pumps
(military aircraft type)
Model RG-9080 illustrated



Engine driven fuel pumps
(commercial aircraft type)
Model RD-7420B illustrated

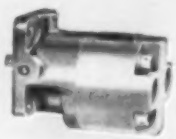
Electronic cooling units
(aircraft)
Model RR-10850 illustrated



Engine driven vacuum pumps
(aircraft)
Model RD-38708 illustrated

Oil-free air pumps
(aircraft, AC-motor)
Model RR-10900-8 illustrated

Camera vacuum pumps
(aircraft)
Model RG-7730-1A illustrated



Pneumatic motors
(aircraft)
Model RD-7440A illustrated

Absolute pressure switches
(aircraft)
Model RG-8395 illustrated

Bilge and refueling pumps
(aircraft, portable)
Model RR-9110 illustrated

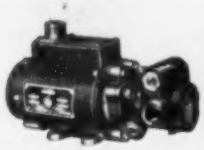
Anti-detonant injection pumps
(aircraft)
Model RR-9700B illustrated

3-element
lube and scavenge pumps
(gas turbines)
Model RG-9990 illustrated

Hydraulic oil booster pumps
(aircraft)
Model RG-9460D illustrated

Oil transfer pumps
(aircraft)
Model RG-9840 illustrated

Electric hydraulic pumps
(aircraft)
Model RG-10430 illustrated



12-V fuel booster pumps
(aircraft, line type)
Model RG-10340A illustrated

Submerged fuel booster pumps
(aircraft)
Model RR-11050 (B-18B type) illustrated

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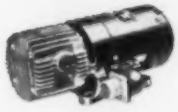
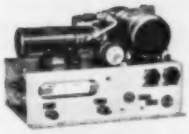


Oil-free air pumps
(aircraft, DC-motor)
Model RG-9065 illustrated

Bombsight dessicators
(aircraft)
Model RR-10040B illustrated

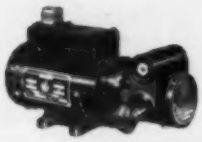


Radar pressurizing kits
(aircraft)
Model RR-10200B illustrated

Pressurization control panels
(aircraft)
Model RR-10370 illustrated

Ground pressurizing kits
(aircraft, radar)
Model RR-9500B illustrated

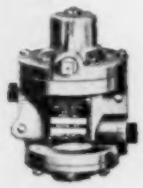
Electric fuel scavenge pumps
(aircraft)
Model RG-9440 illustrated



Heater fuel pumps
(aircraft)
Model RG-9540 illustrated

Fuel transfer pump
(aircraft, line type)
Model RG-7900-2A illustrated

Fuel filter deicer alcohol pumps
(aircraft)
Model RG-5490C illustrated

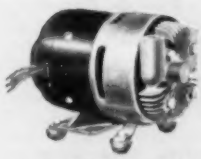


Pressure regulator valves
(aircraft)
Model RD-10120 illustrated

Pneumatic actuating cylinders
(aircraft)
Model RD-10400 illustrated

Ethylene glycol and
coolant pumps (aircraft)
Model RD-9860-D illustrated

Water pumps
(industrial)
Model RD-7250 illustrated



Oil-free air pumps
(industrial)
Model RG-5860A illustrated

Barrel pumps
(industrial, hand and electric)
Model RG-10800-C illustrated

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• HYDRAULIC

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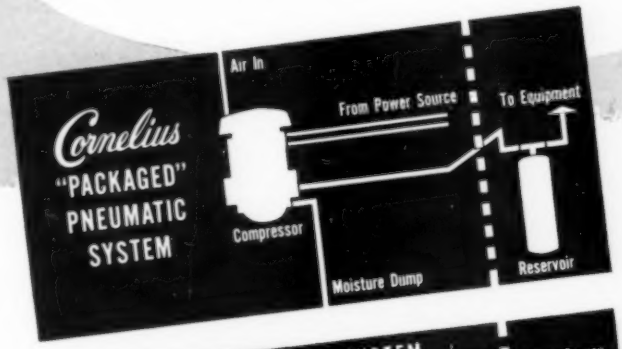

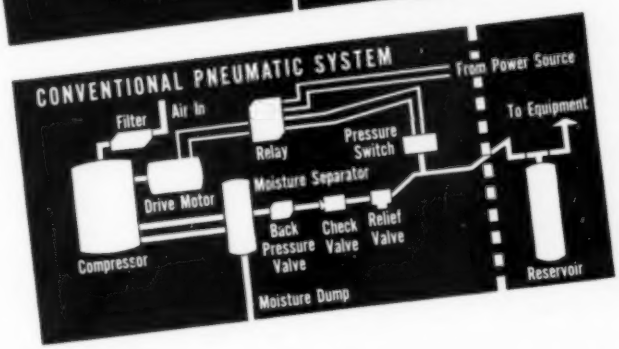

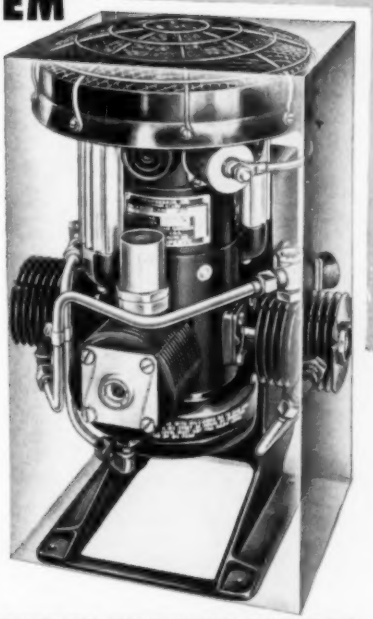

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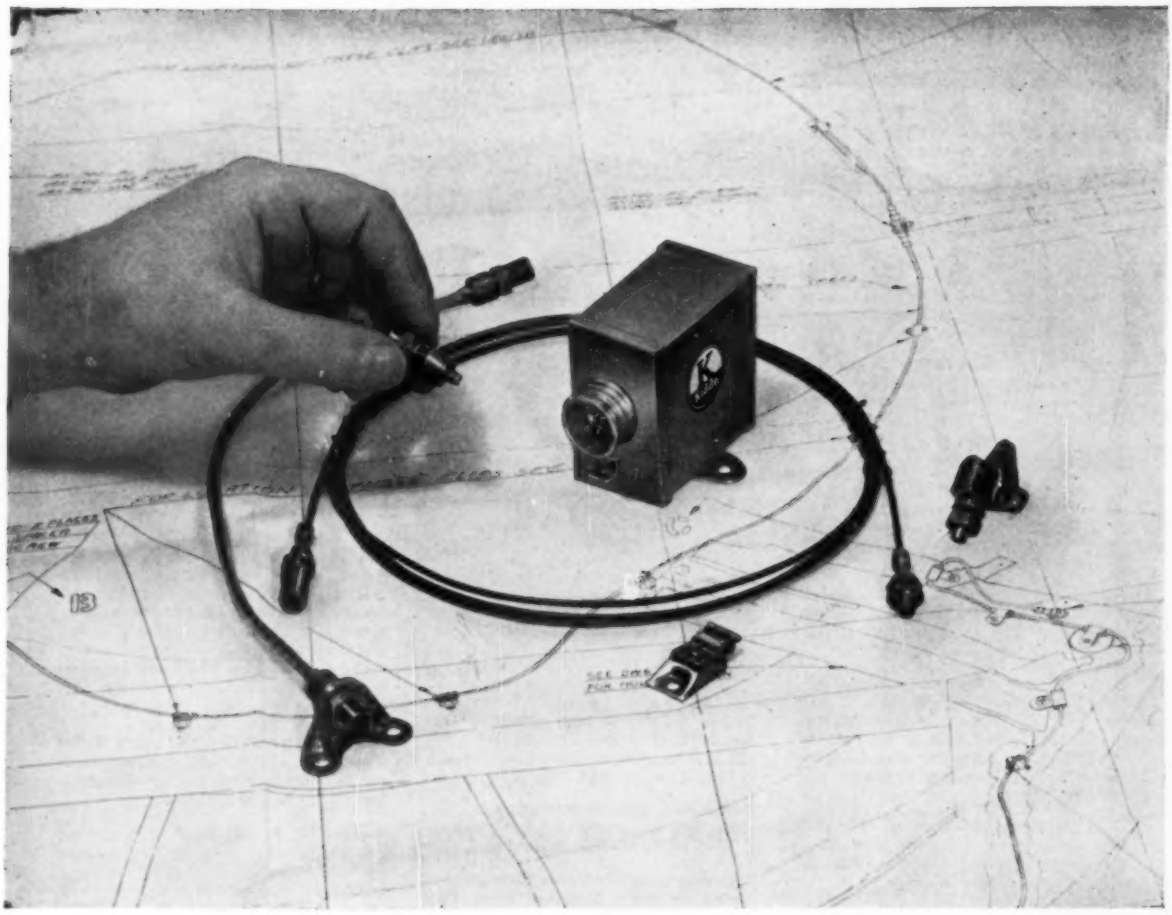

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AIRCRAFT EQUIPMENT
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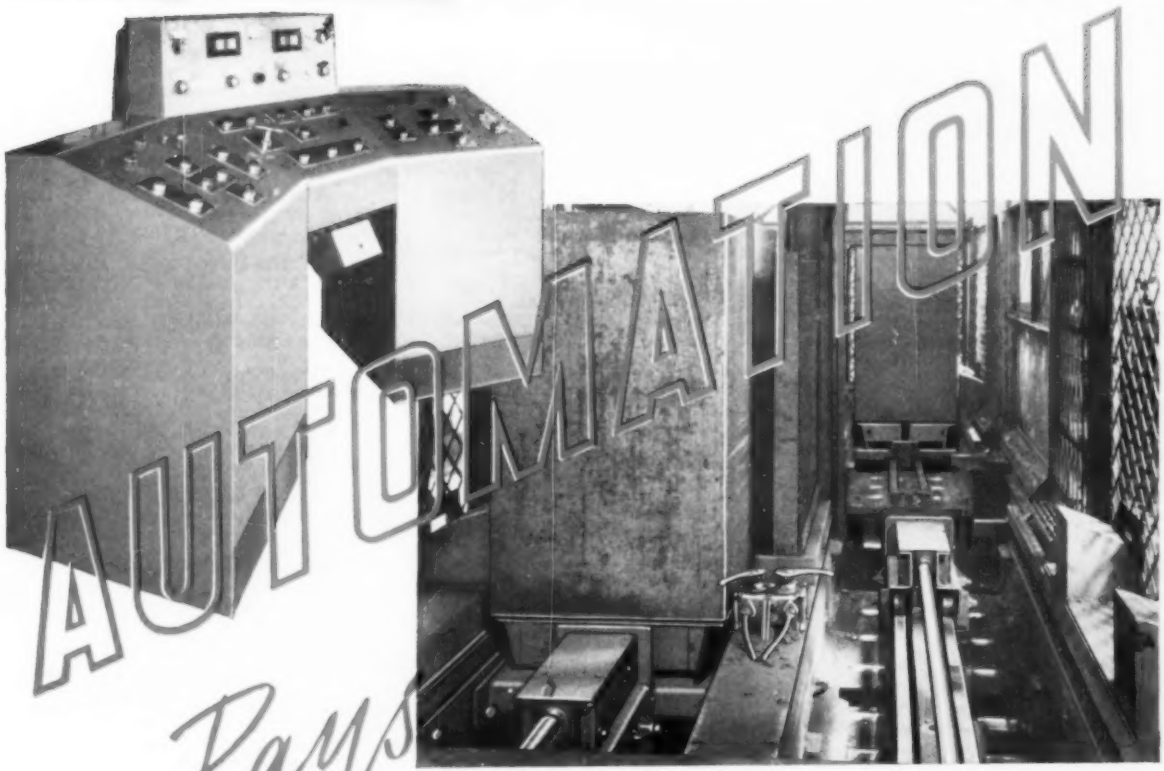

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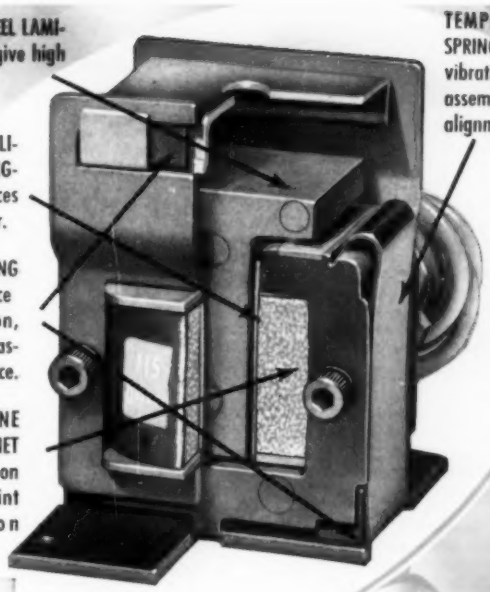

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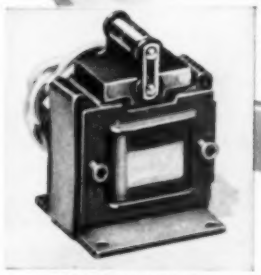

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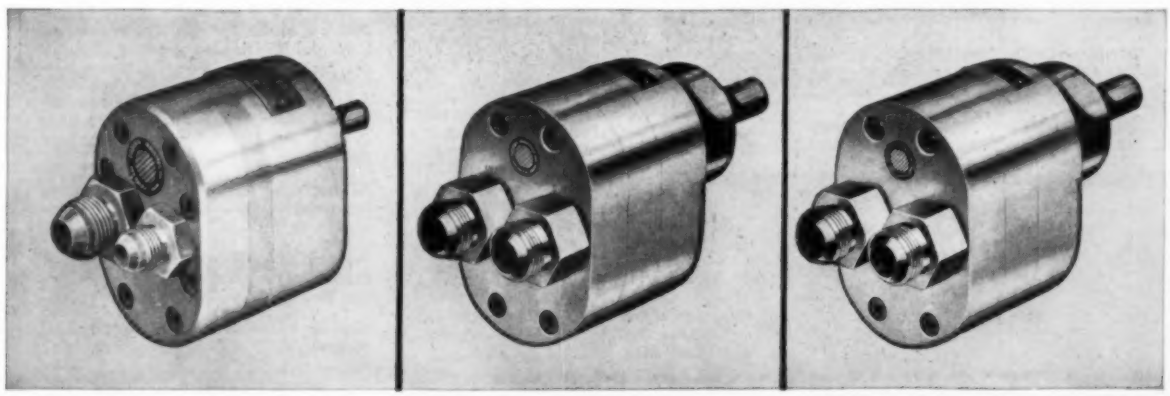

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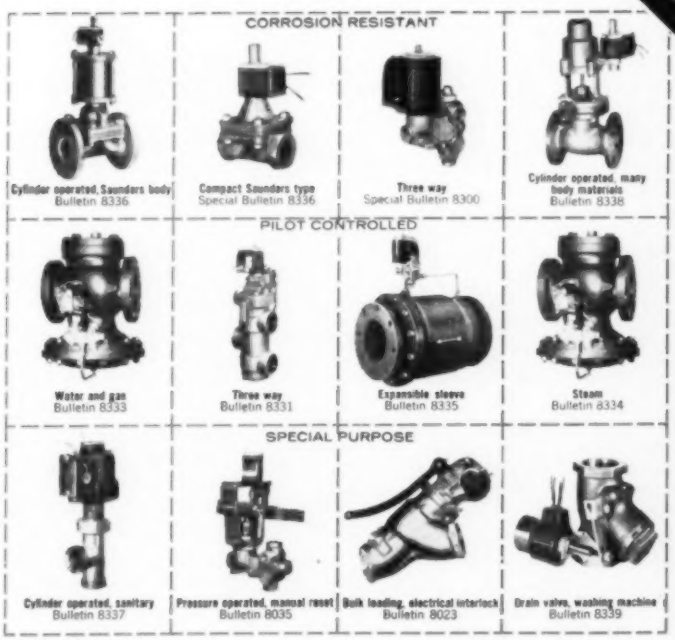

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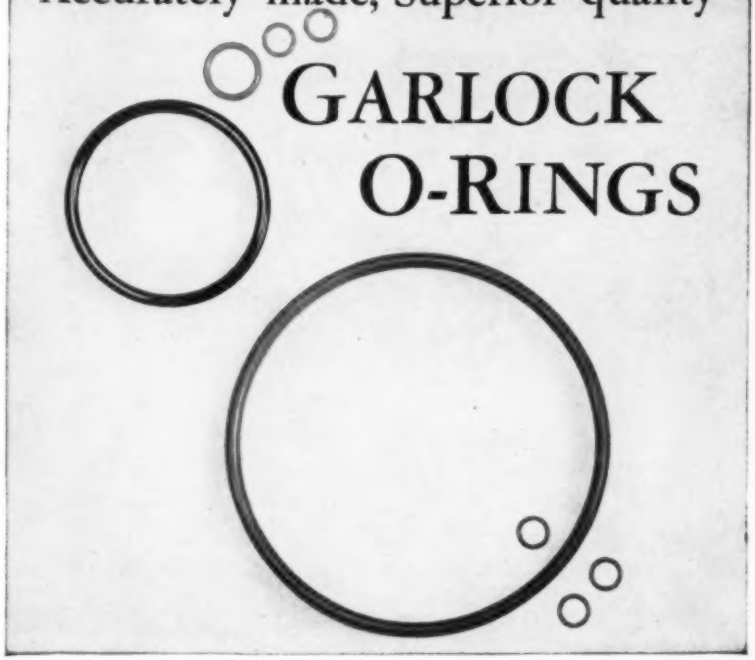

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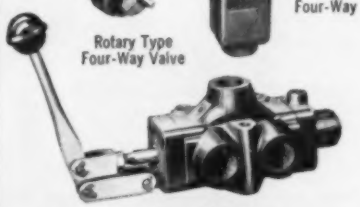
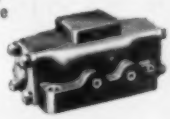
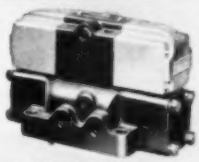


Manually Operated Four-Way Valve



Pilot Operated Four-Way Valve



Solenoid Controlled Pilot Operated Four-Way Valve

Solenoid Operated Four-Way Valve

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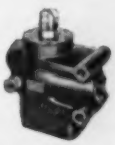

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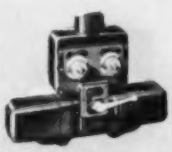
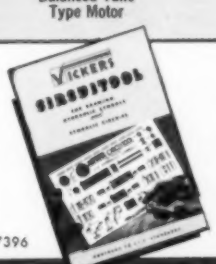


Traverse and Feed Cycle Control Panel



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• AIR & OIL

Air Cylinders in Woodworking. J. E. HYLER. Wood Worker Dec 1945. Double-acting cylinder with integral valve and control; applications include clamping, and work transfer.

Design of Hydraulic Systems. H. FIELD, Jr. Product Eng Mar 1945.

Designing Hydraulic Actuating Cylinders. J. E. THOMPSON, R. B. CAMBELL. Western Flying Dec 1944, Jan 1945. Practical design for typical double-acting, pin-joint cylinder.

Easily Made Compressed Air Cylinder Has Many Uses. C. W. HINMAN. Am Mach Nov 23 1944. Cylinder clamps, holds and releases work in jigs; develops 400-600 psi from 80 psi line; schematic drawing and design.

Hydraulic Controls for Present and Post-War Products. Product Eng Feb 1944.

Hydraulic Cylinder Design. Machy (Lond) Jan 13 1944. Checking for strength; modifications of present design.

Hydraulic Cylinders. J. S. THOMPSON, R. B. CAMBELL. Product Eng Mar, May 1942. Design for hydraulic cylinders; end caps threaded to cylinder barrel; preliminary design; cylinder bore calculations; required stroke; eliminating weight; space allowances; piston design; sealing methods.

Bugs in Oil Line. A. E. RYLANDER. Tool Engr Feb 1941. Faults in design and installation of commercial hydraulic appliances.

Lockheed Hydraulic Remote Controls. Machy (Lond) Nov 18 1937.

How to Design for Hydraulic Operation. H. F. VICKERS. Product Eng Dec 1931. Design operation of cylinders, pumps, piping, tanks, and valves for hydraulic control systems.

DIE CASTING MACHINES

Triulzi Die Casting Machines. Automobile Engr Apr 1955. Largest standard production machine to produce castings in aluminum with locking pressure of 1200 metric tons; direct ram operating system; hydraulically actuated with water.

Ternstedt Promotes Speed and Safety in Die Casting. Tooling & Production Jan 1955. All machines have gates that close and open automatically; dies cannot close until safety block is raised; non-flammable solution of soluble oil used in hot end of hydraulic circuit; other safety and time saving factors.

Accumulator Cut-Out Circuit Reduces Fire Hazard. J. E. BULLEN. Applied Hydraulics Oct 1954.

Simplified Circuit Controls Special Purpose Die Casting Machine. Applied Hydraulics July 1953. Production of electric motor rotors on a manually operated vertical machine. Variable displacement pumps are used.

Triulzi Type 16,000 Cold Chamber Die Casting Machine. Machy (Lond) Apr 24 1953. Die Casting machine with direct hydraulic closing; ejection effected either mechanically or hydraulically; machine operated by push buttons.

Non-Flammable Hydraulic Fluid for Die Casting Machines. Precision Metal Molding Apr 1952.

Die Cast Safety—Circuit Design Reduces Fire Hazard. J. W. PALMER. Applied Hydraulics Oct 1951. Master and slave system keeps oil at the cold end and actuates hot shot cylinder with water oil solution.

Four Second Cycle Die Casting. W. R. ELLIS. Applied Hydraulics Aug 1949. Use of booster assembled integrally with die closing cylinder; hydraulic circuit diagram; sequence of operations.

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Hydraulically Operated Diecasting Machine. Engineer Aug 6 1948. Description of mold clamping, metal injecting, core pulling, and ejecting.

1000-Ton Diecasting Machine. Iron Age Mar 25 1948. Cold chamber all-hydraulic machine; automatic feeding system.

Automatic Mechanical Ladling. E. F. ROSS. Steel Mar 15 1948. Automatic ladling on large aluminum die casting machine; layout and operating cycle.

Core Operating Devices for Die Casting Dies. N. FIELD. Machy (Lond) May 29 1947. Core withdrawal devices including automatic hydraulic method.

Air Operated M55-A Die Casting Machine. Machy (Lond) Apr 27 1944 (see also Indus Power & Production July 1944). Machine for small part production.

E. M. B. No. 12 Die Casting Machine. Machy (Lond) Oct 29 1942. Pneumatically operated, hydraulically controlled machine.

Pressure Die Casting. A. STREET. Mech World Aug 5 1938. Includes conformation on first die casting machine made about 1835; operated hydraulically.

Zinc-Alloy Die Casting Machines. Engineering Mar 4 1938. Brief description of hydraulically operated machine.

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Standards for Industrial Control. National Electrical Manufacturers Assn, New York. Construction, test, performance, manufacture of industrial control equipment.

Timing Engineering. M. G. SAAKE. Ribbie Engineering Co, Jersey City. Reference book on industrial timers and their applications.

Simple Air Driven Pusher Requiring Many Electrical Controls. R. E. MILLER. Applied Hydraulics Nov 1955. Circuitry on handling machine used to bundle and tie newspapers.

Timer Circuit for an 8 Volt Control Valve. M. G. SAAKE. Applied Hydraulics Nov 1955.

Two Limit Switch Actuated Timers. M. G. SAAKE. Applied Hydraulics Sept 1955. Circuit provides adjustable dwell at both ends of piston travel.

Anti-Repeat Air Clutch Press Control. R. E. GIBONEY. Steel Processing Aug 1955.

Safety and Maintenance Factors in Electro-Hydraulic Design. K. B. REXFORD. Elec Mfg Aug 1955.

Electronic Control of Fluid Motors. R. C. BOOTH. Applied Hydraulics July 1955. Fluid motor-driven rolls on multi-color printing press are synchronized electronically.

Counter Actuates Solenoid Valve to Control Piston Travel. Applied Hydraulics July 1955. Accurate piston travel control is supplied by electronic counter.

Motor Timers for Dwell Control. M. G. SAAKE. Applied Hydraulics June 1955. Detailed description of motor timers and their application to three different fluid powered machines.

Switch and Relay Selection for Hydraulic Lift Trucks. R. G. VANCE. Applied Hydraulics June 1955. Pressure and limit switches used in control circuit of electrically powered 2000-pound truck.

Electrical Control Elements in An Air Powered Machine. Applied Hydraulics May 1955. Pneumatic and electric circuits for automotive engine block testing machine.

Hydraulic Systems and Electrical Controls for Automation. W. C. GOECKEL. Machy (NY) Mar 1955. Discussion of hydraulic cylinders, motors and valves, electrical switches, solenoids, timers, wiring, and control devices; importance in locating, clamping, and transferring of work pieces, as well as feeding of various machining, inspecting, and testing units.

Types of A-C Motor Controls. G. W. HEUMANN. Mill & Factory Dec 1954, Jan 1955.

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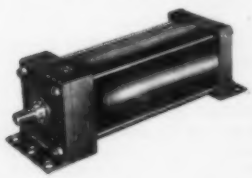

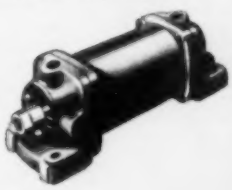

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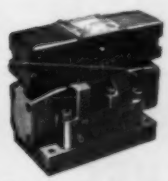

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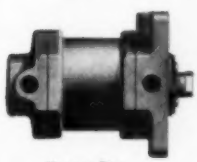

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Motor Overload Relays. J. SHEETS. Prod Eng Jan 1955. Operation and application of bimetal thermal overload relays for various types of service.

Advantages of Electro-Hydraulics on a Vertical Grinder. R. C. MONTANUS. NCIH Proc v IX 1955. Description of electrical and hydraulic circuits and components.

Hydraulic and Electric Circuitry for Machine Tools. H. W. BROWN, J. H. SMITH. Applied Hydraulics Dec 1954.

Electro-Pneumatic System on Induction Hardening Equipment. A. M. KNORR. Applied Hydraulics Oct 1954. Circuit details for a typical production operation, explain construction and safety features.

Designing Wiring Diagrams for Electro-Hydraulic Controls. K. B. REXFORD. Elec Mfg July 1954. "Position-pressure-time" as tool in developing electric control; steps in design procedure.

Lower Machine Costs With Circuit Redesign. H. MORTENSON. Applied Hydraulics July 1954.

Hydraulic Control System for 6-Speed Chucking Machine. R. C. EBERSOLD. Applied Hydraulics July 1954.

3 Pressure Switch Controlled Accumulator Circuits. R. P. ESSER. Applied Hydraulics June 1954.

Valve Actuation with Rotary Solenoids Permits Compact Package Design. B. B. BECKER. Applied Hydraulics June 1954. Fork truck hydraulic system design.

Air Powered Strapping Machine Reduces Handling Costs. Applied Hydraulics May 1954.

Air-Electric Relays Link Pneumatic and Electric Control Systems. W. W. O'HARA. Product Eng Apr 1954. Types of pneumatic-electric relays; operation; application.

Some Industrial Applications of Oil-Hydraulic Control and Power Operating. C. CLENCH. S African Instn Mech Engrs—J Mar 1954. Damper control with transmitter, slave cylinders, indicators, other applications, combined electrical and hydraulic systems.

Electrically Controlled Air Circuits Improve Machine Operation. R. E. TAGGART. Applied Hydraulics Oct 1953. Design of machine for wrapping and sealing packages of ream paper, pads, books, etc.

Machine Cycle Controlled by Electric Timer. N. J. CAVAGNARO, JR. Applied Hydraulics Sept. 1953. Booster circuit on laundry equipment which bales wiper cloths.

Control Circuits for Feed-Clamp-Work Cycle. R. L. HANKIN. Applied Hydraulics Aug 1953. Electrical and hydraulic design details of tube cut-off machine.

Hydraulic Control Systems. R. HADEKEL. Machine Design Apr, May, June 1953.

Photoelectric Control Starts Ram Travel after Proper Part Alignment. Applied Hydraulics Mar 1953. Photocell signals solenoid valve operation on five-station machine.

Electro-Hydraulic System for Multi-Slide Turning Machine. E. SMITH. Applied Hydraulics Mar 1953. Machining compressor wheels for jet engines, tool layout and feed circuits are shown.

Torque Control in Deep Hole Drilling Eliminates Tool Breakage. Applied Hydraulics Oct 1952. Electronic torque limiting device signals solenoid valves controlling drill feed.

Safety Circuits for Hydraulic Machine. H. L. STEWART. Prod Eng Aug 1952.

Would An Electro-Pneumatic System Solve Your Machine Timing Problem? Applied Hydraulics Aug 1952. Rotating cutter is synchronized with linear extrusion speed on a brick and tile machine.

Pressure Switch Reversal of Piercing Tools. R. P. ESSER. Applied Hydraulics May 1952. Electrical and hydraulic circuit for piercing press.

Electrical Interlocks Simplify Hydraulic Control. M. W. MORRISON. Applied Hydraulics Mar 1952. Control circuit for bending machine making automotive trim.

Pressure Switch Controlled Booster Circuit for Production Testing. D. A. KUHNA, W. W. HUTCHERSON. Applied Hydraulics Feb 1952. Circuit design for automotive brake light testing machine.

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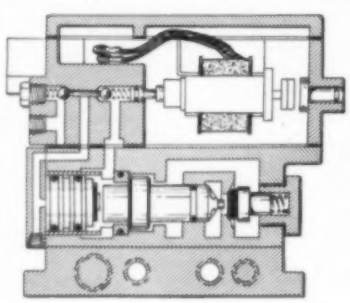

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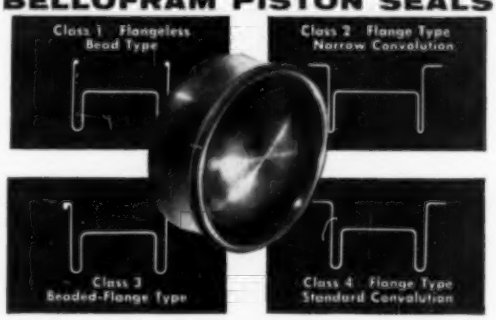
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Controlling Compressed Air for Greater Reliability. A. H. GIPSON. Mill & Factory Dec 1951.

Precision Timing of Lathe Tooling with Limit Switch Controlled Air and Hydraulic Cylinders. J. L. STRAUB. Applied Hydraulics Dec 1951.

Timer to Reverse Stroke and a Limit Switch to Unload Pump. R. P. ESSER. Applied Hydraulics Oct 1951. Cycle control elements on oil powered machine.

Solenoid Air Valves in Automatic Machines. R. C. MAY. Product Eng Oct 1951.

Two Timers Control Piercing Tools. R. P. ESSER. Applied Hydraulics Sept 1951. Hydraulic and electrical circuit layout.

Combine Limit Switch and Timer Control. R. P. ESSER. Applied Hydraulics Aug 1951. Electrical control on multi-cylinder pierce press.

Electrical Circuits for Hydraulic Press Control. K. B. REXFORD. Applied Hydraulics July 1951. Step-by-step layout showing necessary switches, relays, and interlocks to control solenoid operated valves.

Timing Relay Provides Stroke Reversal. R. P. ESSER. Applied Hydraulics June 1951. Electrical control of hydraulic piercing press.

Electrical Controls Automatize Dinnerware-forming Machines. S. H. FELDMAN. Elect Mfg Mar 1951. Basic hydraulic system with interlocking electrical controls.

Combines Three Controls. A. H. SCHUTT. Applied Hydraulics Feb 1951. Design of electro-hydraulic circuit on multi-spindle drilling machine.

Hydraulics Can Give High Speeds. Applied Hydraulics Sept 1950.

Pressure Actuated Switches. G. A. STARBIRD. Applied Hydraulics Apr, June 1950. General considerations in application of pressure actuated switches; definitions of terms; application factors; measurement of pressure and surge; symbols.

Production Increased 400 Percent. F. W. HICKS. Applied Hydraulics Apr 1950.

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Fluid Drive for Ross Forming Machine. R. P. ESSER. Applied Hydraulics Nov 1949.

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The Correlation of Hydraulic and Electric Control Circuits. D. E. GERBERICH. Applied Hydraulics Oct 1949.

Oscillating Pilot Controls Valve. W. J. SCHUPNER. Machine Design Aug 1949.

Electronics Need Not Scare You. R. C. ROETGER. Applied Hydraulics Sept, Dec 1948. Basic electronic components; characteristics of tubes; phototube; thyratron; direct acting relay circuit; inverse acting relay circuit.

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Air Circuits for Material Handling. W. J. SCHUPNER. Applied Hydraulics Nov 1948.

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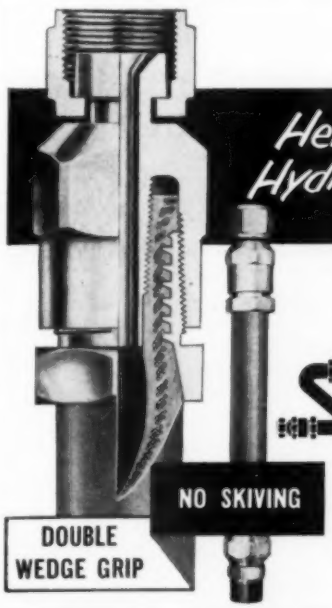

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Improved Hydraulically-Operated Grinding Machines. Engineer Nov 8 1946.

Broaching Bores in Bevel-Gear Blanks on Self-Feeding Machine. Machy (NY) Oct 1946 (see also Iron Age Oct 10 1946).

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Allison Octopus. P. D. AIRD. Machine Tool Blue Book Dec 1945.

Electro-Hydraulic Valve Manufacturing. Western Machy & Steel World Aug 1945.

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Simple and Compound Hydraulic Circuits. F. C. HERBERT. Tool Eng May 1945.

Basic Controls for Sequence Operations. R. O. PERRINE. Machine Design Apr 1945. Design of control for automatic machines; sequence operations; cycle control; steps in designing control scheme; controls for reciprocating motors; protection of hydraulic circuits in electro-hydraulic systems.

Hydraulic Transmission and Control of Power. H. O. FUCHS. Elec Mfg Feb 1945. Coordination of hydraulic and electrical systems.

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Solenoid-Operated Hydraulic Valves for Aircraft Applications. G. A. GOEPFRICH. Elec Eng Nov 1944.

Remotely-Operated Controls for Aircraft Hydraulic Systems. R. E. MIDDLETON. Automotive & Aviation Industries Oct 15 1944.

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Centralized All-Electric Control for New Plastic Injection Molder. R. L. ROUGEMONT. Elec Mfg Mar 1944.

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Co-Acting Drive—Electric Hydraulic Mechanical. L. S. ANDRICH. Machine Design Apr 1941.

Hydraulic Welding Positioner Simplifies Work. H. KLEIN. Iron Age Mar 13 1941.

Hydro-Electric Controls in Automatic Screw Machine. Product Eng July 1937.

Hydraulically Operated But Electrically Controlled. Elec Mfg Aug 1936.

ELECTRICAL SWITCHGEAR CONTROL

Reduce Breakaway Torque on Heavy Rotating Machinery. H. H. ROTH, W. B. CART. Applied Hydraulics Aug 1955. High pressure hydraulics supports generator bearings to reduce friction loads.

Hydraulic Device Closes Circuit Breaker. E. R. PERRY. Applied Hydraulics May 1955. Design of hydraulic power package which serves as emergency closing device.

Advance in Pneumatic Mechanism for High-Voltage Power Circuit Breakers. R. C. Van SICKLE, R. N. YECKLEY. Am Inst Elec Engrs—Trans (Power Apparatus & Systems) Aug 1954. Applied to breakers of 15,000 MVA and more.

New Hydraulic Mechanism for Power Circuit Breakers. E. R. PERRY, N. W. MORELLI. Am Inst Elect Engrs—Trans (Power Apparatus & Systems) Apr 1954. Faster reclosing; sealed from dust and moisture; trouble free mechanism.

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Operating Mechanisms for High Capacity High-Voltage Oil Circuit Breakers. E. B. RIETZ. Am Inst Elec Engrs—Trans (Power Apparatus & Systems) Apr 1953. Desired characteristics and best methods to obtain them.

Pneumatic-Hydraulic Closing Mechanism for Circuit Breakers. Engineer Nov 21 1952 (see also Engineering Dec 12 1952). Mechanism is based on energy stored in air at high compression.

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Electro-Pneumatic Control Speeds Heavy-Contactor Operation. G. W. HEUMANN. Power Mar 1944. Air operated contactors used when electromagnetic types become too large.

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ELEVATORS
• HYDRAULIC •

New Assembly Method for Jet Engines. A. J. AULD, Jr. Applied Hydraulics May 1955. Hydraulic lift permits vertical assembly.

Mechanical Car Parking—CAP System. Surveyor Aug 7 1954. Hydraulic Platform brings car to parked position.

Remotely Controlled Hydraulics Positions "Hot" Materials in Radiation Lab. CHARLES M. GEORGE. Applied Hydraulics Aug 1954. Explanation of hydraulic positioning devices at Los Alamos.

10-Ton Capacity Pneumatic Hoist. Engineer Mar 21 1952. Lift height of 60 ft; operates at 80-100 psi.

Development of the Oil-Hydraulic Elevator. Applied Hydraulics Nov 1951. Discussion of components and operating characteristics.

Hydraulic Elevator Telescopes Into Portable Unit. Product Eng Apr 1944. Model has telescoping cylinders and is completely portable; description.

Traffic Lane Markers Are Adjusted Hydraulically to Speed Traffic. Roads & Bridges Aug 1941.

Hydraulic Transmissions in New Applications. C. MOREY. Machine Design Sept 1932. Hydraulics for hoists, equipment operating in explosive atmospheres; Diesel-engine drives, sequence operations; reduces explosion hazard; increases Diesel throttle range; multiple operation possible.

FILM LIST

Operation Pushbutton. 31 min; 16mm; sound. Loan: The Bellows Co Akron, Ohio. Film covers pneumatic operations in some 60 plants in United States and Canada.

Liquids in Motion. 13 min; 16mm; sound. Loan: Civil Aero Adm, Aviation Ed Div, Commerce Bldg, Washington 25 D C. Shows fundamental reason why petroleum oils are such effective lubricants; why different types and grades of lubricants must be available.

Hydraulics. 13 min; 16mm; sound. British Information Services, 30 Rockefeller Plaza, New York N Y. Shows applications of principles of hydraulics; shows that liquids are inelastic and cannot be compressed.

Hydraulics. 11 min; 16 mm; sound. Rent: Ideal Pictures Corp, Chicago Ill; Kunz Motion Picture Service, Philadelphia, Pa; University of Ill, Visual Aid Serv, 713½ S Wright St, Champaign, Ill. Explains principle of hydraulic pressure and method by which liquids are used to transmit power.

Hydraulic Valves—Methods of Operating Valves. Slide film; 50 frames; sound. Loan: Civil Aero Adm; Aviation Ed Div, Commerce Bldg, Washington 25 D C. Studies manual, mechanical, electric, and hydraulic valves; depicts combinations of these types.

Hydraulic Turret Traversing Mechanism. 22 min; 16mm; sound. Loan: The Oilgear Co, Milwaukee, Wis. Shows construction and principle of operation of small two-way, variable delivery pump and constant displacement motor applied to U. S. combat vehicles for training and traversing heavy gun turrets.

Hydraulic Insurance. 12½ min; 16mm; sound (also 35 mm, sound). Loan: Monsanto Chem Co., Organic Chem Div, KXOK Bldg, St. Louis Mo. Development of a fire-resistant hydraulic fluid and its application to hydraulic power in industry.

Before Hydrau'ic Fires Start. 12 min; 16mm; sound. Loan: Monsanto Chem Co, Organic Chem Div, KXOK Bldg, St. Louis Mo. Where and how hydraulic fires start.

Hydraulic Components. Slide films color. Loan: Denison Engr Co, Columbus, Ohio. Designed to broaden understanding of operation of hydraulic components; slides cover pumps, motors, and valves.

Harnessing Liquids; 12 min; 16mm; sound. Loan: Shell Oil Co, New York, N. Y. Rent: Syracuse University, Ed Film Lib, 123 College Pl, Syracuse, N. Y. Demonstrates principle of hydraulics and many applications; shows that liquids cannot be compressed; why great power is exerted by confined liquids; shows many industrial applications of hydraulic power.

Fluid Flow in Hydraulic Systems. 8 min; 16mm; sound; color. Loan: Civil Aero Adm, Aviation Ed Div, Commerce Bldg, Washington 25 D C; U S Navy, Public Information Office, 495 Summer St. Boston, Mass. Sale: Adel Precision Prods Corp, 10777 Van Owen St, Burbank, Calif. Demonstrates and explains nature of liquids, types of flow, causes of types of flow, and flow through pipes and orifices.

Elementary Hydraulics-Derivation of Pascal's Law: Part 1. 16 min; 16mm; sound. Loan: Civil Aero Adm, Aviation Ed Div, Commerce Bldg, Washington 25, D C. Rent: Indiana University, Bloomington, Ind. Sale: United World-Castle Films, Inc, Chicago Ill. Shows that oil is lighter than water; defines density, pressure, and force; explains how to determine each in given amount of fluid.

Elementary Hydraulics—Derivation of Pascal's Law: Part 11. 18 min; 16mm; sound. Loan: Civil Aero Adm, Aviation Ed Div, Commerce Bldg, Washington 25, D C. Rent: Indiana University, Bloomington, Ind. Sale: United World-Castle Films, Inc, Chicago, Ill. Shows several experiments that prove that liquids transfer force equally to all parts of container; repeats Pascal's Law.

Basic Hydraulics. 9 min; 16mm; sound; color. Loan: Civil Aeronautics Adm, Aviation Education Div, Commerce Bldg, Washington 25, D C. Sale: United World-Castle Films, Inc, 605 Washington St, Chicago 5, Ill. Shows hydraulics used in aircraft and in home; proportions and simplifications of force; inverse ratio and area.

Elementary Hydraulics-Application of Pascal's Law: Part 1. 13 min; 16mm; sound. Loan: Civil Aero Adm, Aviation Ed Div, Commerce Bldg, Washington 25, D C. Rent: Indiana University, Audio-Visual Center, Bloomington, Ind. Sale: United World-Castle Films, Inc, 605 W Washington St, Chicago 5, Ill. Reviews Pascal's Law and studies input and output pistons and hydraulic system in actual motion. Demonstrates how work is done by hydraulic system and the measurement of work.

Elementary Hydraulics-Application of Pascal's Law: Part 11. 16 min; 16mm; sound. Loan: Civil Aero Adm, Aviation Ed Div, Commerce Bldg, Washington 25 D C. Rent: Indiana University, Audio-Visual Center, Bloomington, Ind. Sale: United World-Castle Films, Inc, Chicago 5, Ill. Demonstrates Pascal's Law, using two output pistons; broadens information contained in part 1. Explains principles of hydraulic brakes and hydraulic jack.

Dial Indicator Gages. 18 min; 16mm; sound; color. Federal Prods Corp, Sales Promotion Dept, 1144 Eddy St, Providence 1, R I. Teaches basic facts on how to use dial indicator gages.

Compressed Air Power. 17 min; 16mm; sound; color. Compressed Air & Gas Institute, Educational Comm, 1410 Terminal Tower, Cleveland Ohio. Presents graphically theory of compressed air; shows operating principles of various types of compressors.

Characteristics of Hydraulic Fluids. 10 min; 16mm; sound. Loan: Civil Aeronautics Adm, Aviation Ed Div, Commerce Bldg, Washington 25, D C. Explains and illustrates essential qualities of hydraulic fluids; points out that they must be able to lubricate moving parts, reduce friction and prevent wear; must be free of water, rust, and other impurities; must be of proper viscosity for job.

Basic Principles of Hydraulics. 16mm; sound. Sale: The Jam Handy Organization, Detroit 11, Mich. Presents basic principles of hydraulic pressure; how liquids are used to transmit power; working models and laboratory experiments show fundamentals of hydraulic pressure; utilization of hydraulic pressure.

Airplane Hydraulic Systems. 15 min; 16mm; sound. Loan: Civil Aeronautics Adm, Aviation Ed Div, Commerce Building, Washington 25 D C. Rent: Indiana University, Audio-Visual Center, Bloomington, Ind, University of Michigan, Audio-Visual Education Center, 4028 Administration Bldg, Ann Arbor Mich. Explains simple hydraulic system and discusses principles involved; shows how it is applied to operation of retractable landing gear.

FILTERS
• AIR •

Moisture Removal From Compressed-Air Pipelines. L. WALTER. Mine & Quarry Eng Feb 1955. Properties of compressed air; consideration of drain points; drainage of piping by separators; small pipe line air filters; diagrams.

Compressed Air Processing for the Protection of Pneumatic Equipment. D. G. FAUST. NCIH Proc v VIII 1954. Filtration; pressure regulation; lubrication.

Efficient Piping of Compressed Air. L. WALTER. Rock Products Nov 1954.

Protect Your Air Tools from Moisture. E. C. POWERS. Power Oct 1954. Water vapor problem in compressed air systems; recommended layout for air piping systems.

Moisture and Pressure Control in A High Pressure Pneumatic Circuit. J. L. DOOLEY, H. D. SAMUEL. Applied Hydraulics May 1954.

Clean Constant Air for Instruments. D. J. PEARSE. Mill & Factory Sept 1953. How to make sure pneumatic type control instruments receive clean, dry air at right pressure.

Air Plants Need Proper Auxiliaries. Roads & Streets June 1953.

How to Design Compressor Accessories. L. J. MURPHY. Pertoleum Refiner Mar 1953.

Automatic Drainage of Compressed Air Systems. A. S. WADSWORTH. Mech World Feb 1953. Selection of equipment for drainage of precipitated moisture; maintenance points.

Improve Your Compressed Air Supply. R. A. SCHAEFER. Factory Mgmt & Maintenance Nov 1952.

Intake for Air Compressor Affects Efficiency. E. C. POWERS. Power Sept 1952.

Air Line Filtration, Regulation and Lubrication. D. G. FAUST. Machine & Tool Blue Book Aug 1952. Requirements for air line filter; factors in choice of air pressure regulator such as "regulation characteristic", "flow characteristic", etc; oil fog lubrication.

Moisture Removal from Compressed-Air Pipelines. L. WALTER. Colliery Eng

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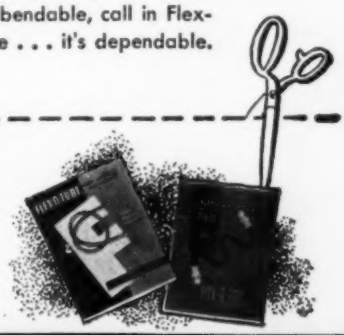

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FILTERS • AIR

Oct 1951. Improved water-separation methods.

Cleaning Compressed Air. A. E. WILLIAMS. Eng & Boiler House Rev June 1951. Equipment to **eliminate** oil, dirt, water; filters; float traps; layout of air line with filters.

Separation of Moisture from Compressed Air. L. WALTER. Modern Power & Eng Apr 1951. Mechanical separation and drainage; air separators and filter-type separators; principle of aridifier abstractor.

Pure Air for Pneumatically-Operated Instruments. Mech World Feb 23 1951. Schematic layout for supplying air 95% dry; diaphragm compressor described and illustrated.

How 7 Companies Save Dollars with Air Filters. Applied Hydraulics Dec 1950. Results of air filter installation in seven applications.

Refrigeration Removes Moisture from Compressed Air Lines. J. PARTINGTON, JR. Heating & Vent Oct 1950. Size of refrigerating unit required to avoid moisture condensation.

Meet Condensifilter, for Use Where Extra Dry and Clean Air is Needed. Compressed Air Mag Mar 1950. Devices for extraction of dirt and moisture from compressed air where unusually clean, dry air is required.

Line Pressure Determines Compressed-Air Cooling. J. D. CONSTANCE. Power July 1949. Moisture in pipe lines; proper temperature to which air must be cooled following compression.

Simplify Your Calculations for Air Compression and Humidity. W. T. RICE. Power Generation May 1949. Limitations on permissible moisture content; analysis of compression system; effect of humidity on performance of compressor; data given facilitate calculations entailed; chart.

Pneumatic Tool Maintenance Pays Off. W. J. VOSSBRINCK. Southern Power & Industry May 1948.

How to Figure Moisture in Compressed Air. Heating, Piping & Air Conditioning Nov 1947.

Elements of Pneumatic Installation. J. C. DOTNER. Tool Engr May 1945.

Moisture in Compressed Air. C. C. HERMANN. Power Plant Eng Nov 1937. Reducing moisture; failures due to moisture.

Removing Moisture from Compressed Air. A. W .LOOMIS, Heating, Piping & Air Conditioning Sept 1935.

Why and How Compressed Air Should be Cleaned. Power Oct 1933. Removal of moisture, oil and dirt.

Compressed Air Equipment. Power Plant Eng Jan 15 1931.

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FILTERS • OIL •

Where Should a Filter Be Located in a Hydraulic System? Applied Hydraulics Aug 1954. Six locations for the filter are discussed.

Oil Filters for Hydraulic Systems. A. McHUGH. NCIH Proc v 5 1952.

Hydraulic Lock: Another Explanation. J. E. C. STRINGER. Engineering Apr 25 1952. Experiments with felt filter of high efficiency.

How to Keep Oil Systems Clean. A. R. MORSE. Applied Hydraulics Feb 1952.

Reduce Operating Costs with Purifiers. Applied Hydraulics Feb 1951. Maintenance procedures of two die casting companies using fire-resistant fluids.

Oil Filters—What They Are . . . How and Why They Are Used. D. G. VAN VLECK. Applied Hydraulics Nov 1950. Types of filters; factors to consider in selecting filter for specific application.

Hydraulic Valves and Control Devices. L. H. SCHUETTE. Tool & Die J Nov 1946, Jan 1947.

Design of Hydraulic Systems. H. FIELD, JR. Product Eng June 1945. Filters; characteristics; types; applications.

Prime Axiom in Hydraulics is Banish Dirt. H. J. MARX. AVIATION Mar 1944.

Hydraulic System Installations. J. E. THOMPSON, R. B. CAMPBELL. Aero Digest Nov 1941.

FLUID MECHANICS AND • BASIC DESIGN DATA •

Pipe Resistance for Hydraulic, Lubricating and Fuel Oils and Other Non-Aqueous Liquids. T. E. BEACHAM. E. & F. N. Spon Limited, London. Practical considerations; use of diagrams and data required; pipe resistance diagrams for various roughness of pipe bore, viscosities and specific gravities of fluids.

Compressed Air Data. Edited by F. W. O'Neil. Compressed Air Magazine. Book contains theoretical compression of air, installation of compressors, applications and performance, boosters and vacuum pumps, turbo or centrifugal blowers and compressors, intake air, after-cooling, intercooling and vacuum pumps, reheating.

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H.D. 2½	56	114	1200	445
H.D. 5	112	228	1200	625
H.D. 10	165	341	900	1,100
H.D. 20	225	454	600	2,000
H.D. 35	400	786	600	4,000
H.D. 50	500	972	514	5,500
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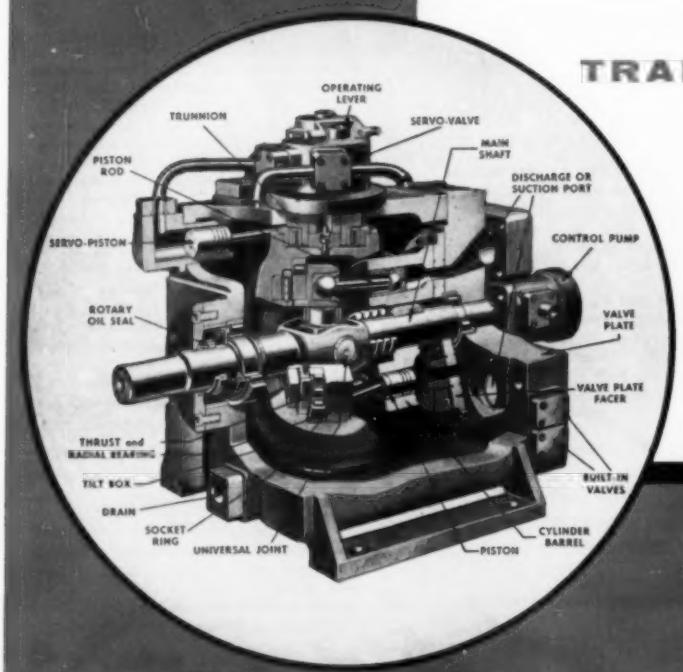

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FLUID MECHANICS & BASIC DESIGN DATA

Cameron Hydraulic Data, Ingersoll-Rand Co., New York. Data on fluid mechanics of water, steam, and other fluids.

Nomographs Relating Hydraulic, Pneumatic and Electrical Energy. A. E. MAINE. Product Eng Nov 1955. Development of nomographs and examples for conversion of pneumatic to electrical energy, hydraulic to electrical energy.

How to Select Fluid Line Sizes for Oil Hydraulic Systems. A. E. MORRIS. Applied Hydraulics Aug 1955.

Safety and Maintenance Factors in Electro-Hydraulic Design. K. B. REXFORD. Elec Mfg Aug 1955.

How Rotation Affects Hydraulic Pressures. Z. JANIA, A. KUSHIGIAN. Machine Design Feb 1955. Calculating pressures and forces caused by centrifugal action on hydraulic fluids in rotating parts of hydraulic devices; examples given for full cylinder rotating about its axis, and for hollow, off-center, and diaphragm cylinders.

Effect of Tube Vibrations on Flow through Tubes. E. SILBERMAN. Minn Univ St Anthony Falls Hydraulic Laboratory—Project Report M27 Nov 1954. Study of whether external tube vibrations are cause of excessive pressure drop in steady flow or of pressure phase lag in establishing flow in aircraft hydraulic systems.

Analogy of Hydraulic, Mechanical, Acoustic and Electric Systems. J. C. SCHOENFELD. Applied Sci Research Sec B 1954. Analogous concepts of each system are tabulated.

Fluid Conversion Factors for Pressure Drop Calculations. R. B. RESEK. Product Eng June 1954. Conversion factors for converting from laboratory to service conditions for pipe and fittings.

On Dynamics of Pressure-Controlled Hydraulic Systems. G. REETHOF. Am Soc Mech Engrs—Paper M54-SA-7 for meeting June 20-24 1954. Indicated that system is essentially closed loop; stability criteria; influence of physical constants; applicability to machine tools, aircraft landing gear, etc.

Introduction to Hydraulics. JONES. Harper, New York 1953. (Book)

Basic Mechanics of Fluids. ROUSE, HOWE. Wiley, New York 1953. (Book)

Application of Frequency-Analysis Techniques to Hydraulic Control Systems. A. C. HALL. Am Soc Mech Engrs—Paper for Meeting Nov 29 Dec 3 1953. Hydraulic control systems studied by linear approximation; study of valve motor control system.

Pressure Surges in Hydraulic Circuits. N. N. SVERDRUP. Product Eng Sept 1953. One cycle of pressure surge described and illustrated; method of calculating amplitude of pressure wave that results from rapid and gradual valve closure; capacity of air accumulator required to suppress pressure surge; application of equations.

Some Problems of Fluid-Flow Measuring Devices. F. V. A. ENGEL. Engineering July 3 July 10 1953. Discussion of orifices, nozzles, and venturis; bibliography.

Hydraulic Control Systems. R. HADEKEL. Machine Design Apr, May, June 1953. Design of machine hydraulic systems for maximum simplicity and effectiveness. Apr: General circuit problems. May: Open-center systems. June: Pilot and electrical control.

Need for Basic Research in Hydraulics. T. K. SHERWOOD. NCIH Proc v V 1952.

Mechanics of Fluids. MURPHY. International, Scranton 1952. (Book)

Fluid Flow in Pipes. McCLAIN. Industrial Press New York 1952. (Book)

Basic Approach to Hydraulic and Pneumatic Design Problems. C. H. HALLET, E. F. HEISER. Applied Hydraulics Nov 1952. A 12-step procedure for designing fluid power systems.

Water Hammer in Hydraulic Systems. H. K. PALMER. Machine Design Sept 1952. Design of hydraulic systems; pressure surge effects resulting from rapid valve closure; formulas and calculations.

Pioneers in Oil Hydraulics. Applied Hydraulics Sept 1952. Brief history of modern hydraulics.

Basic Formulas. Applied Hydraulics July 1952. Data sheet includes formulas for pressure, force, pump capacity, piston velocity, pump horsepower, fluid motor torque, etc.

How to Determine Cycle Time for Hydraulically Powered Operations. E. R. JOHNSON. Applied Hydraulics June 1952. Step-by-step calculations on a production machine for automotive cylinder blocks.

Construction Hints for Hydraulic Equipment. W. T. McCORMICK. Applied Hydraulics Apr 1952. Piping and selection ideas for machine tools.

How Much Air? R. E. MIDDLETON. Applied Hydraulics Mar 1952.

Present-Day Trends in Hydraulics. H. ROUSE. Applied Mechanics Rev Feb 1952. Resume of principal lines of hydraulic investigation; studies relating to problems of conduit resistance, fluid turbulence hydraulic machinery.

Hydraulics and Fluid Mechanics. POWELL. Macmillan, New York 1951. (Book)

Nomographic Charts. C. KULMANN. McGraw-Hill New York 1951. Collection of charts for engineering and mathematical computations; functional scales; general charts; hydraulic charts; thermodynamics charts; electrical charts.

Fluid Mechanics. V. L. STREETER. McGraw-Hill, New York 1951. Elementary course in fluid statics and fluid flow; treats broad fluid principles underlying lubrication, jet propulsion and oil hydraulic systems.

Advanced Fluid Dynamics and Fluid Machinery. R. C. BINDER. Prentice-Hall, New York 1951. Volume bridges gap between introductory and advanced books on fluid mechanics.

Hydraulic Transients. G. R. RICH McGraw-Hill, New York 1951. Book covers arithmetic integration and trial-and error arithmetic to solution of variety of problems in hydraulic transients; important features are integration, tabulations and analysis of surge tanks.

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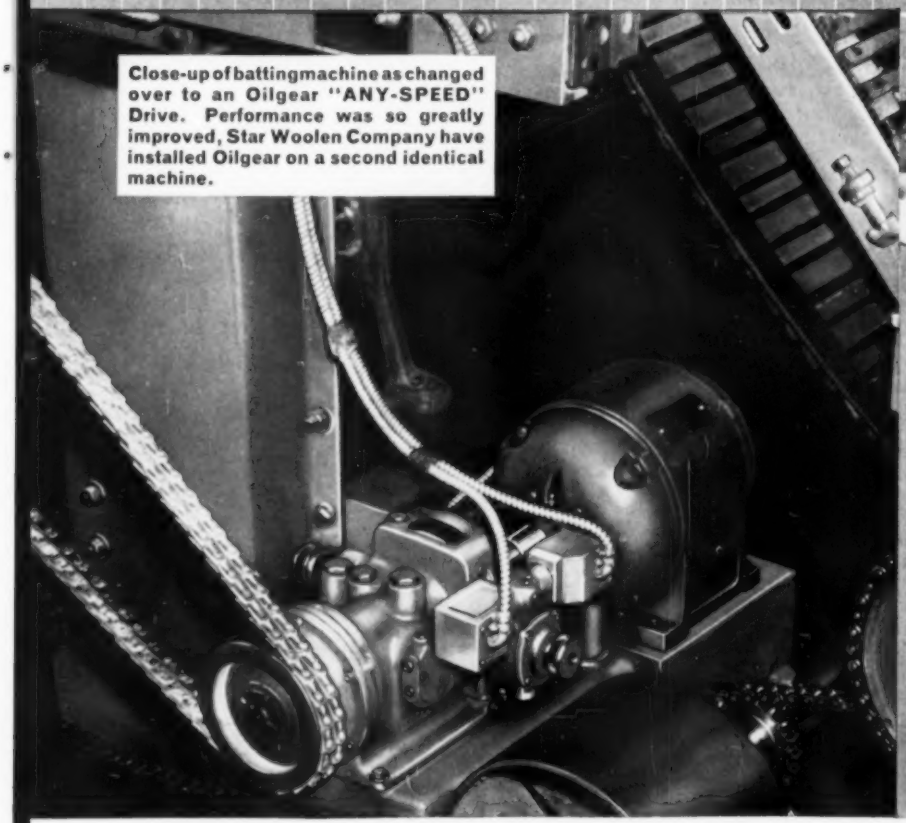

Close-up of batting machine as changed over to an Oilgear "ANY-SPEED" Drive. Performance was so greatly improved, Star Woolen Company have installed Oilgear on a second identical machine.

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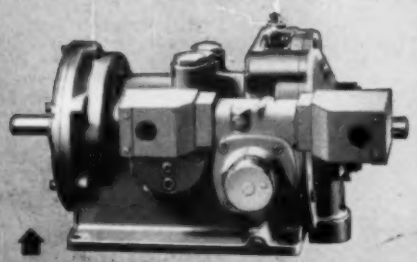

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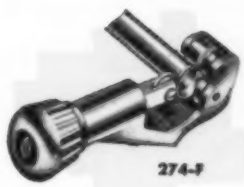

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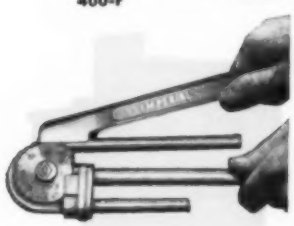

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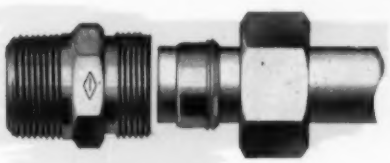

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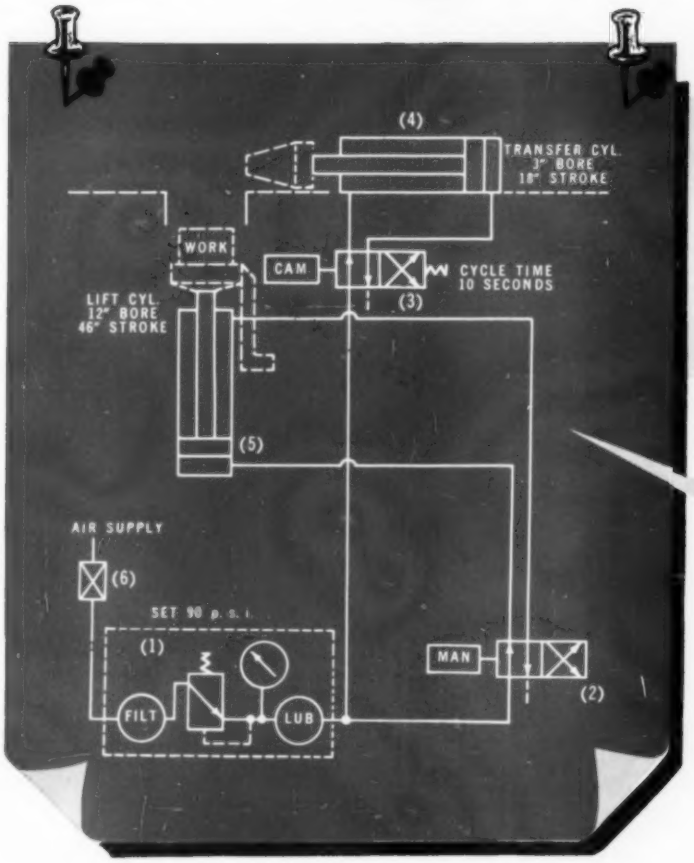

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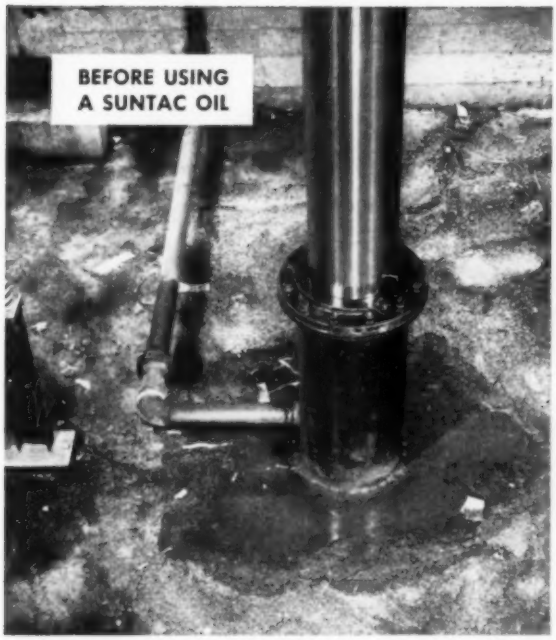

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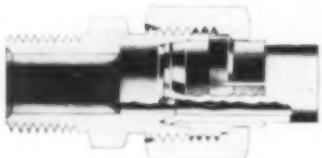

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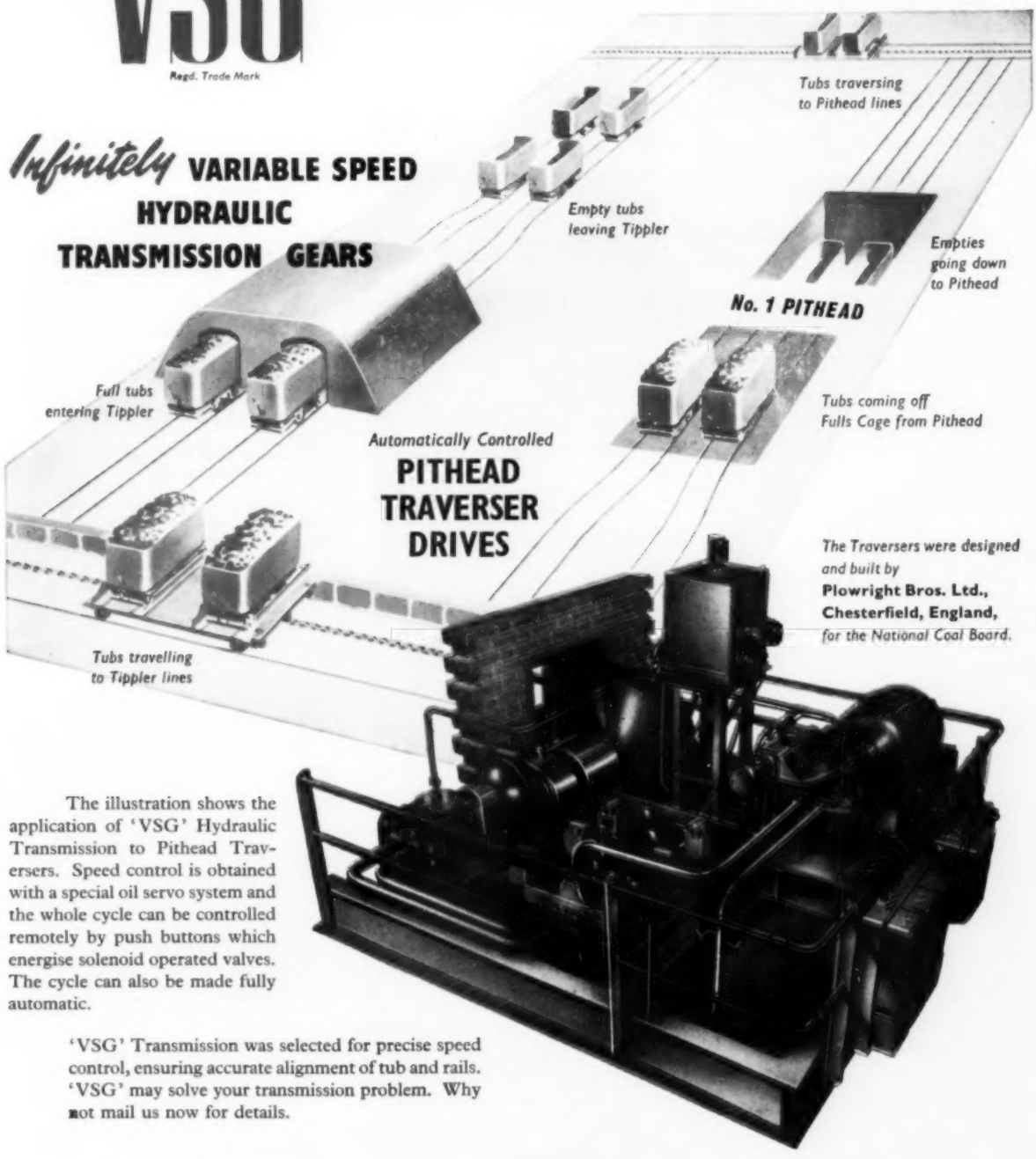
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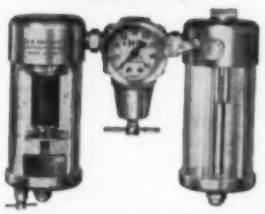

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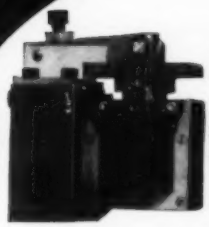

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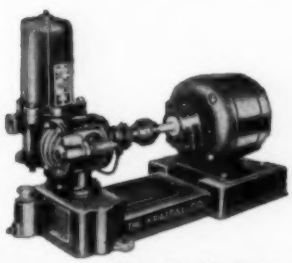

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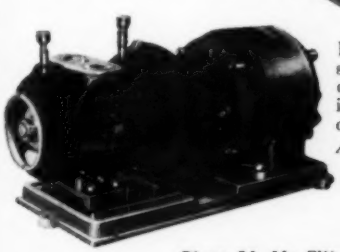

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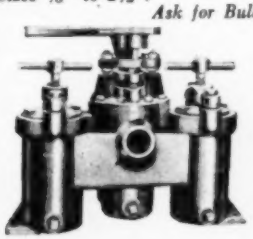

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Here's Production . . . 3000 Rings an Hour! E. L. MACKEY, E. F. HEISER. Ap-

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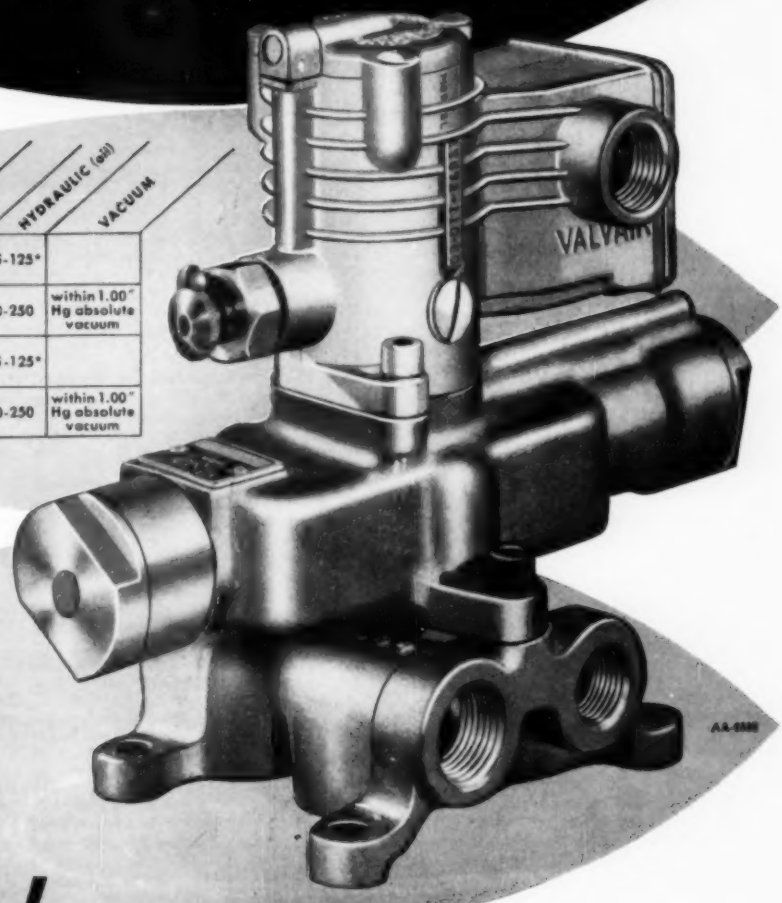

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MACHINE TOOLS

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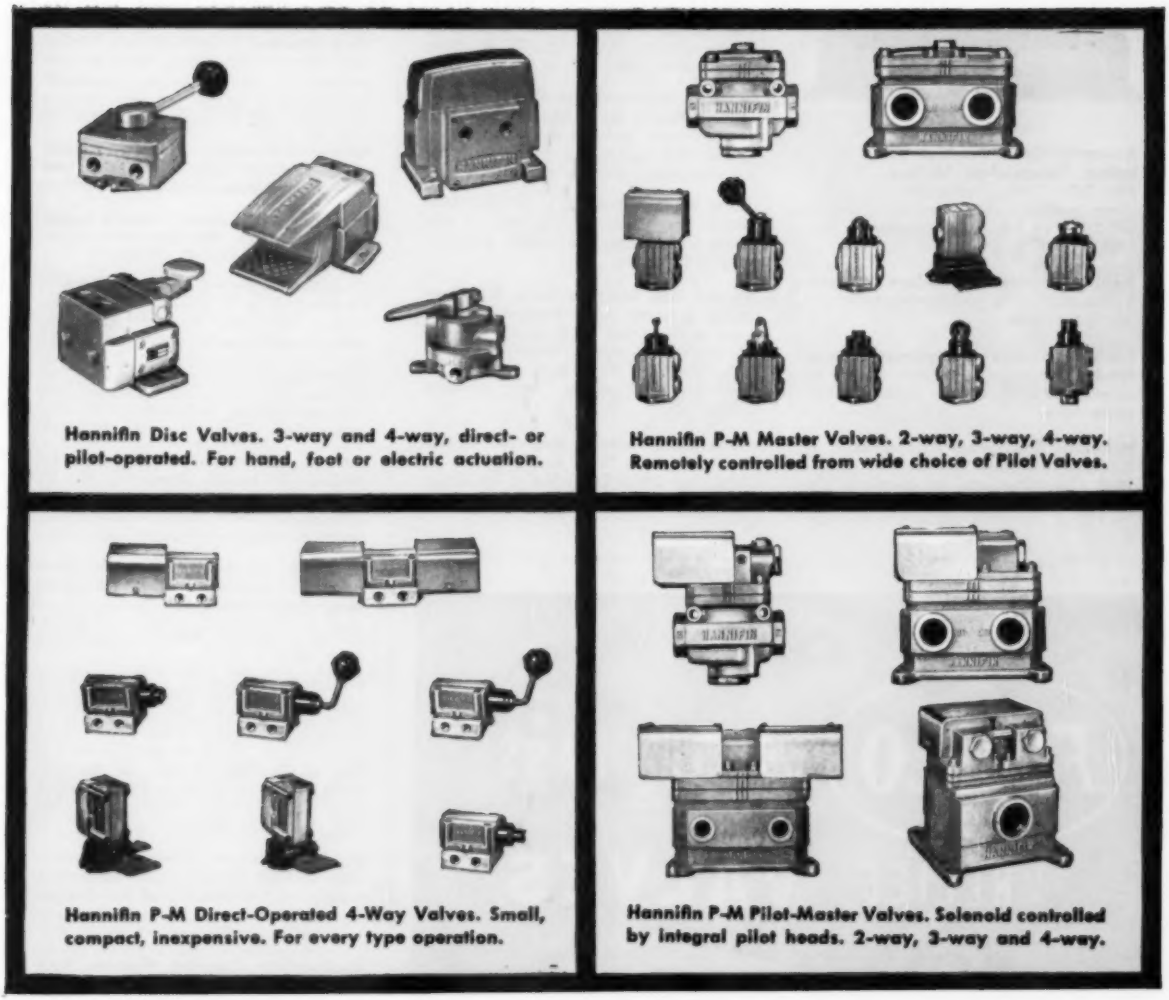

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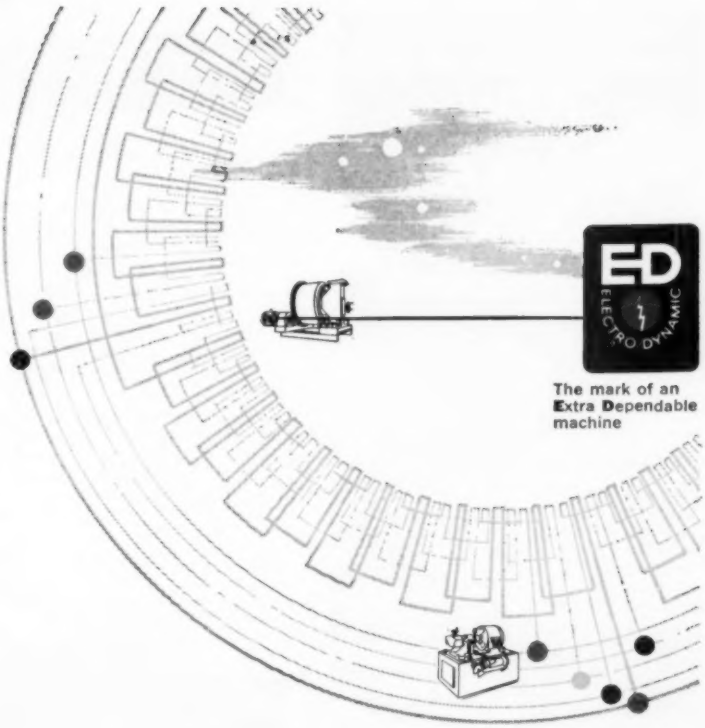

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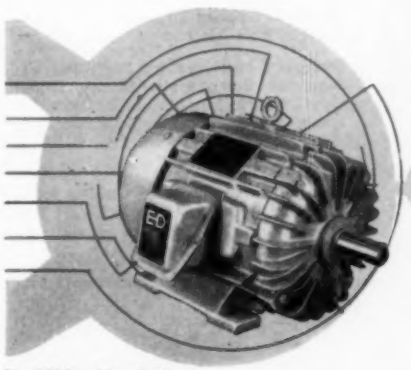

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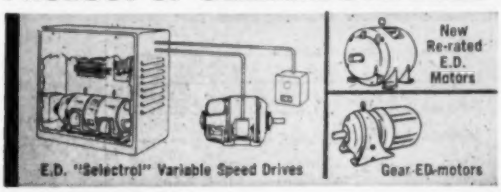

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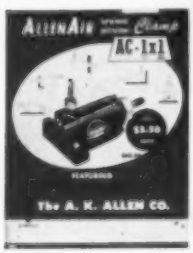

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WATTS

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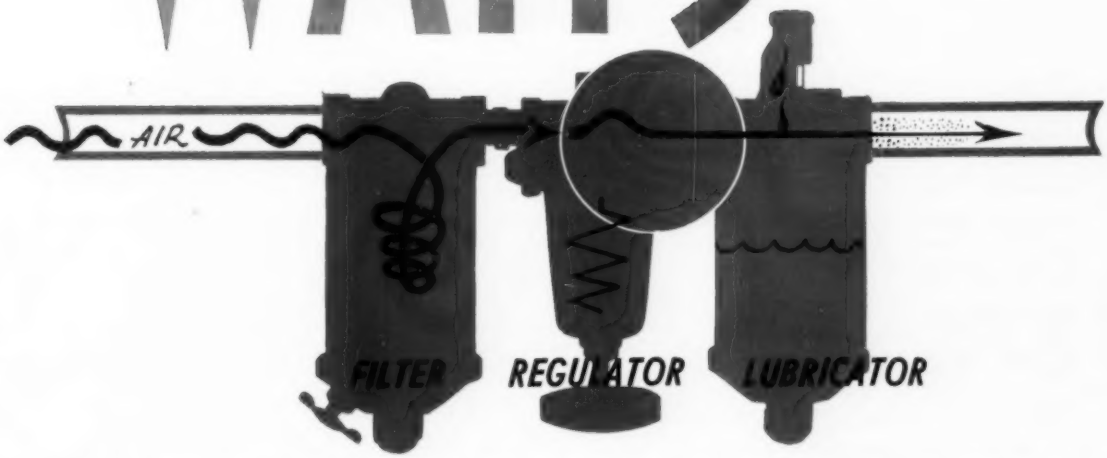

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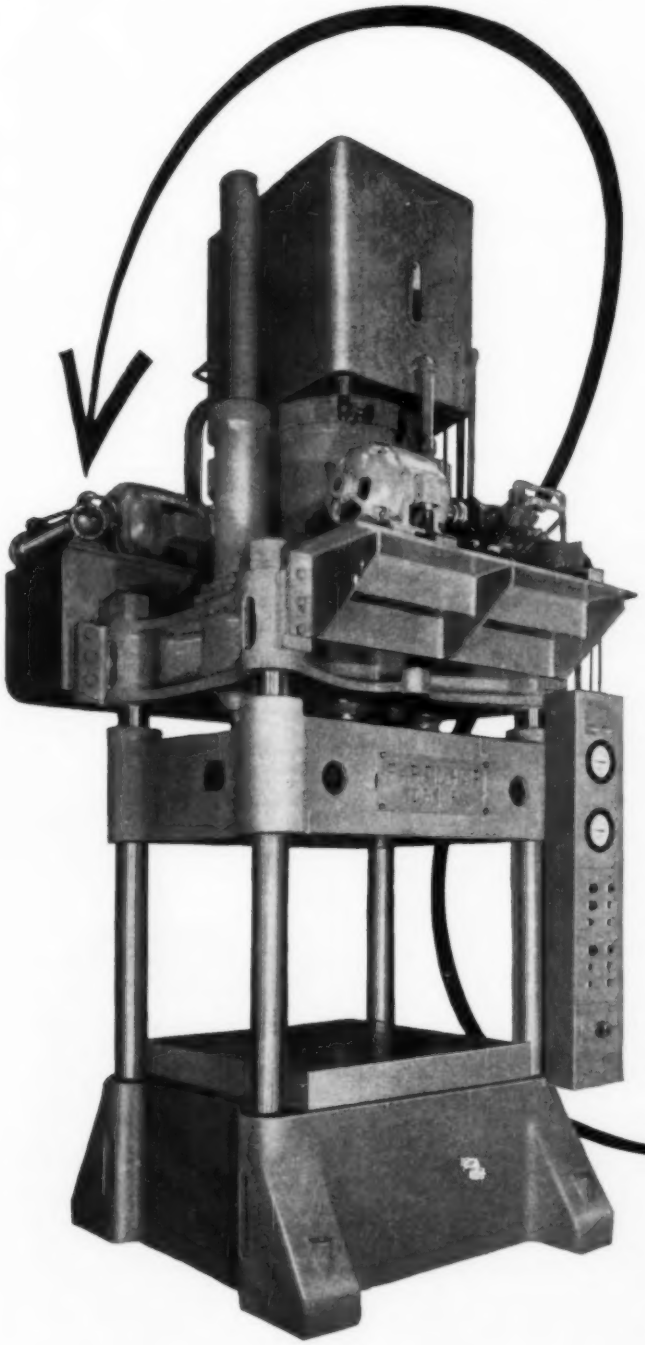

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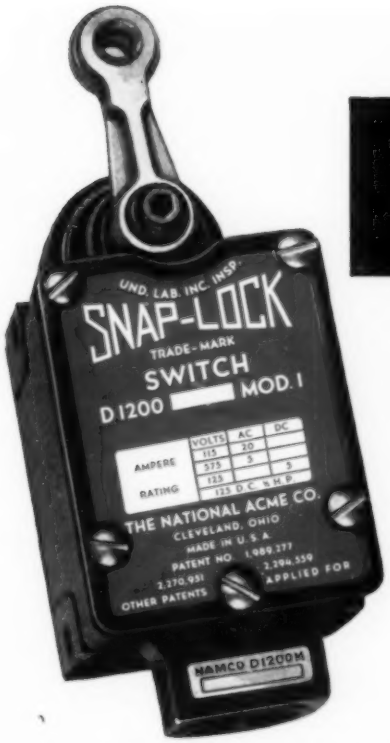

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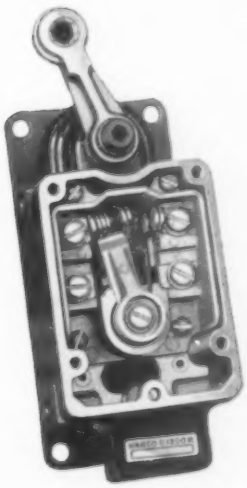

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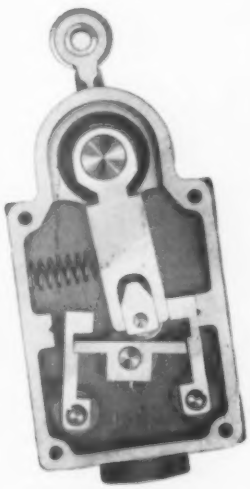

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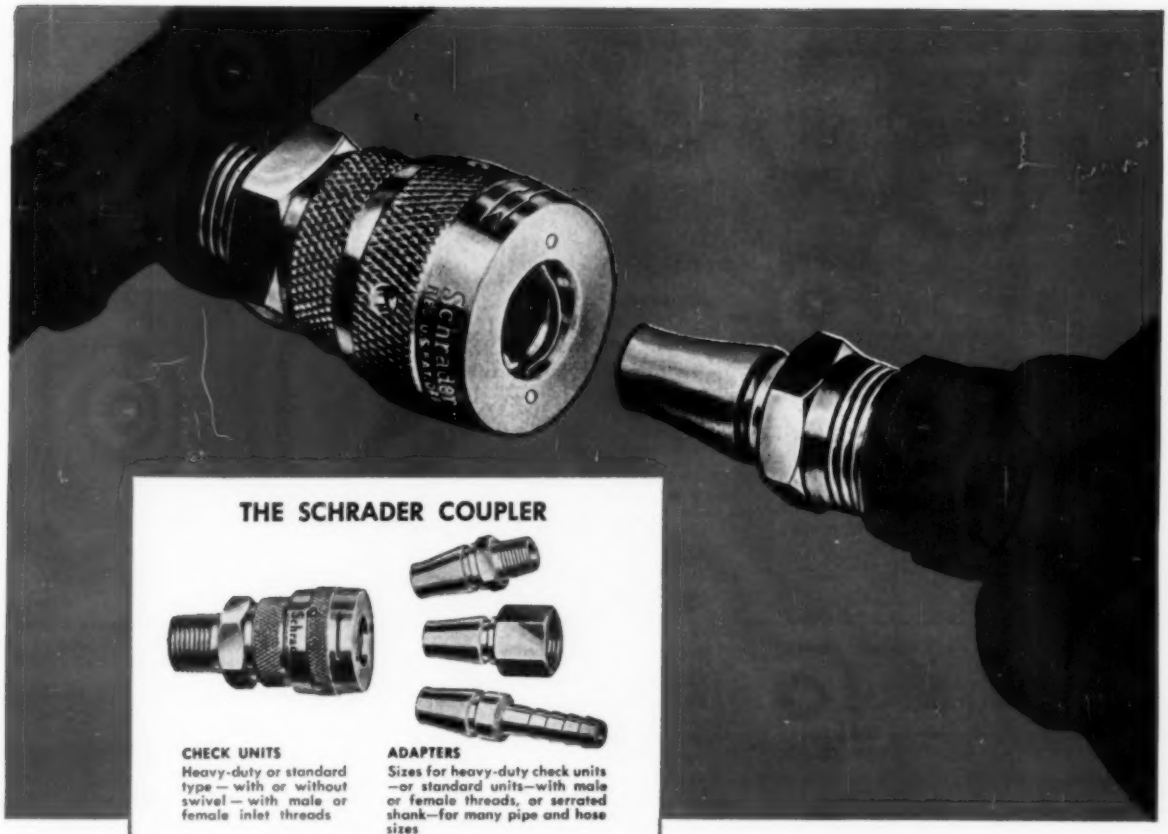
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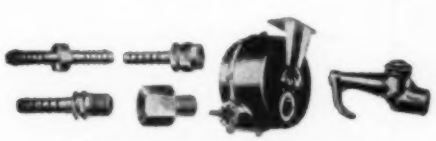

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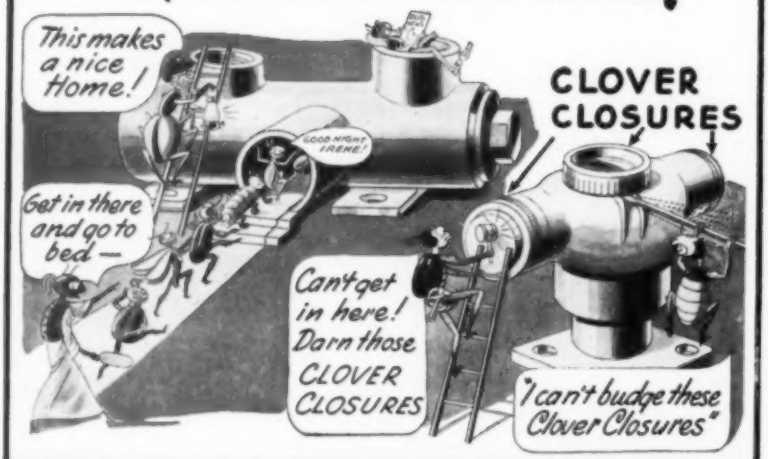
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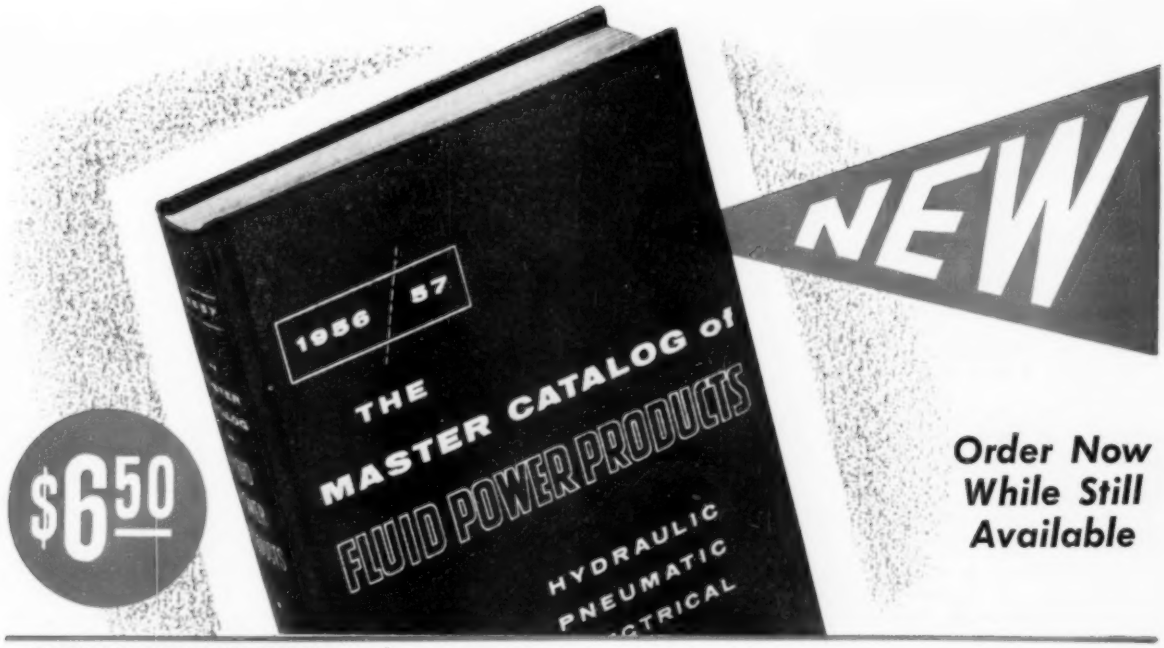

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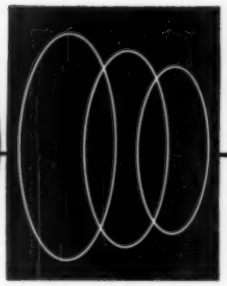

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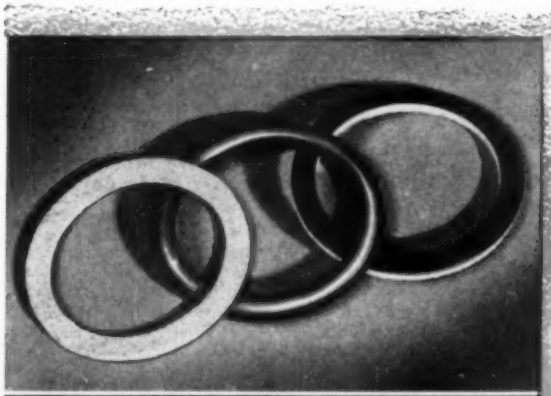

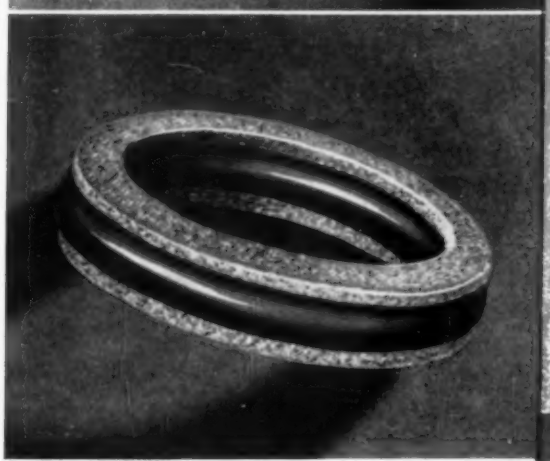

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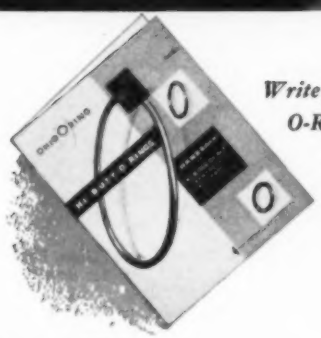

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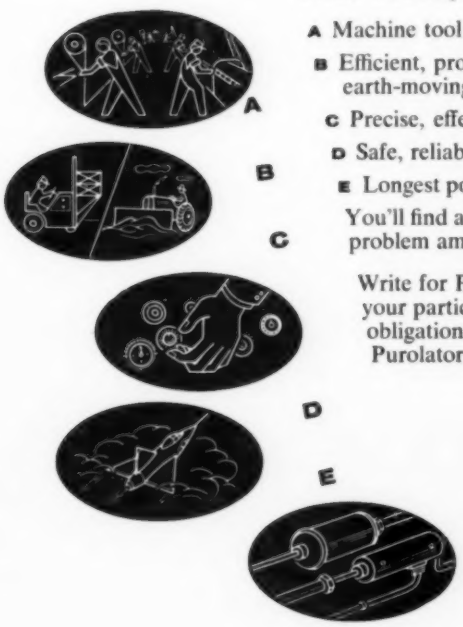

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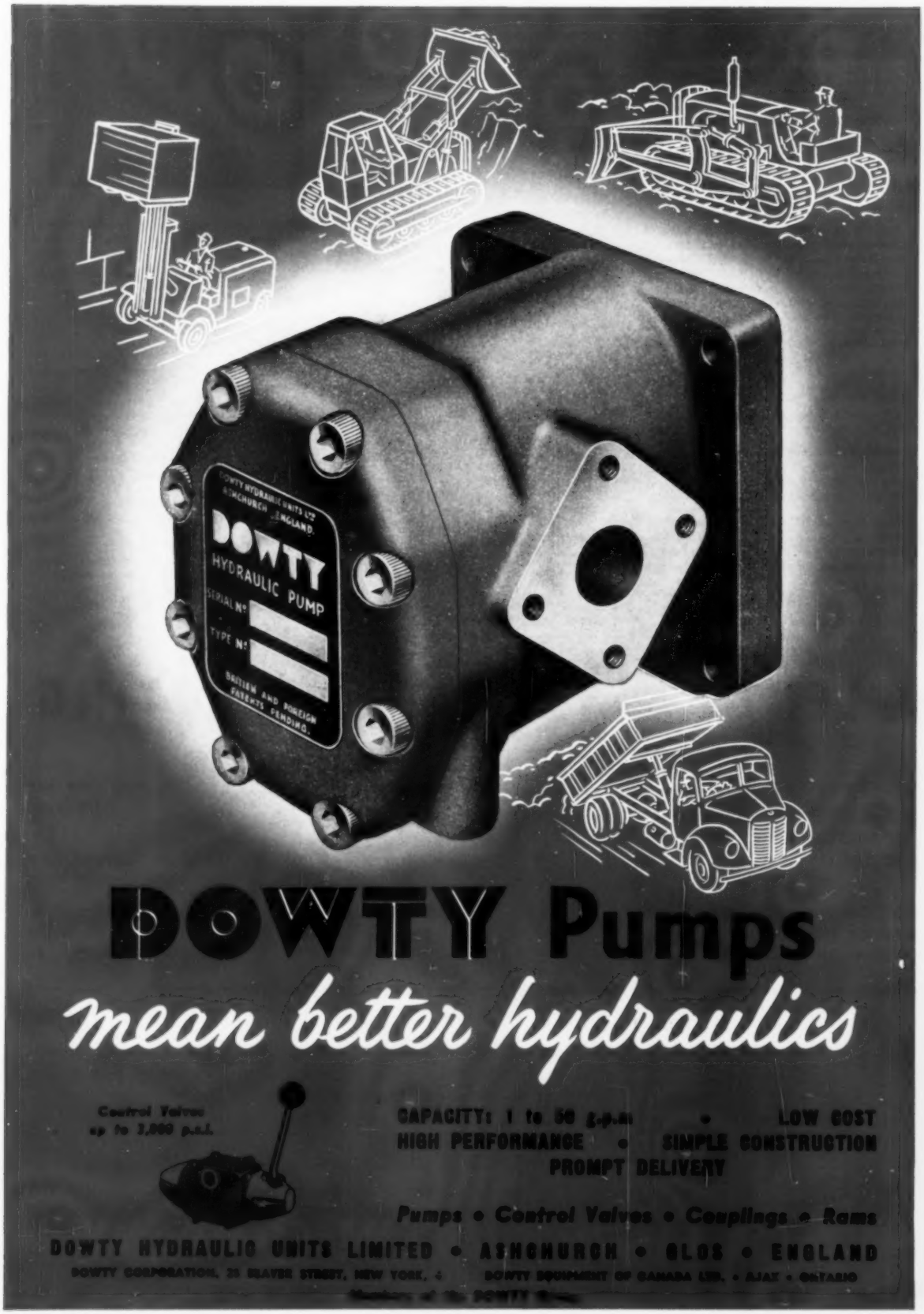
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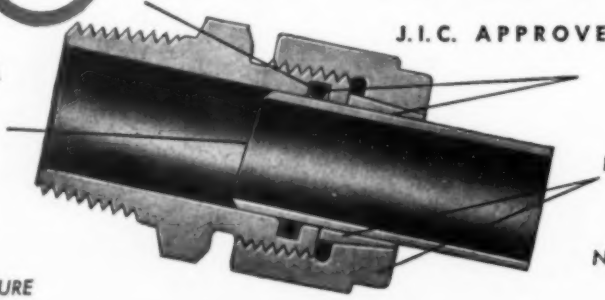

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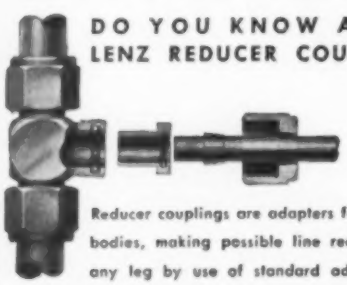

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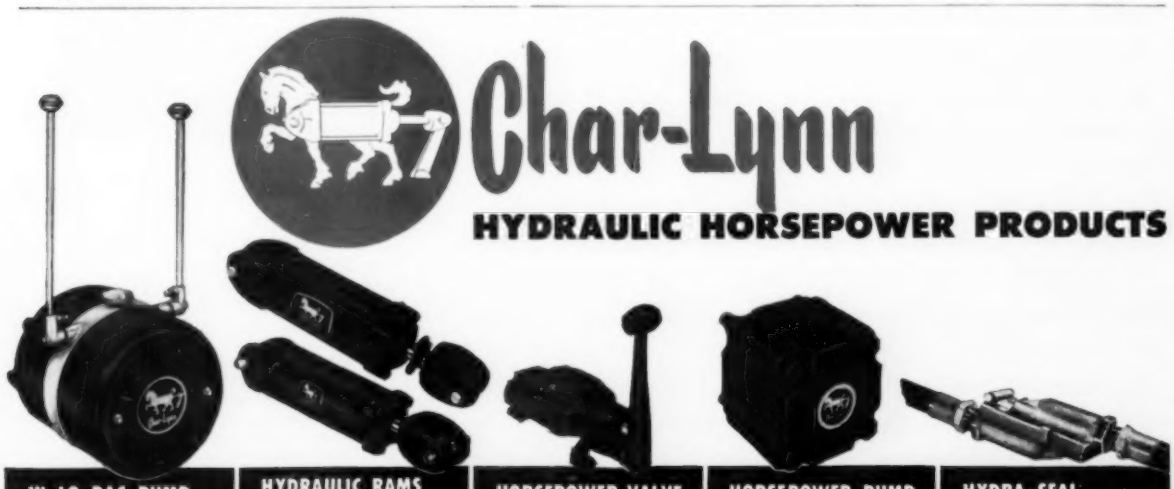

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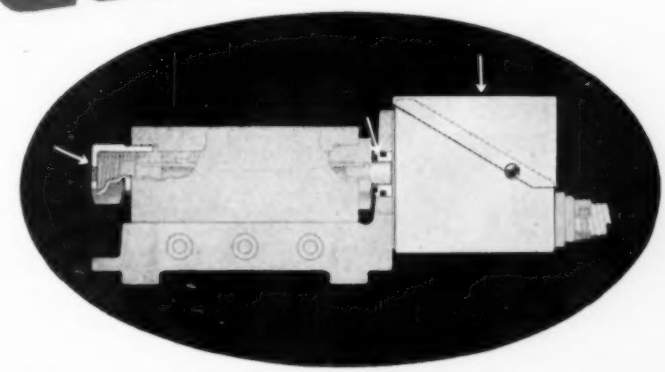

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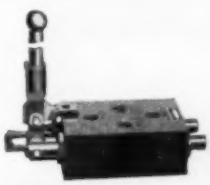

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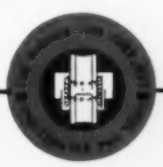

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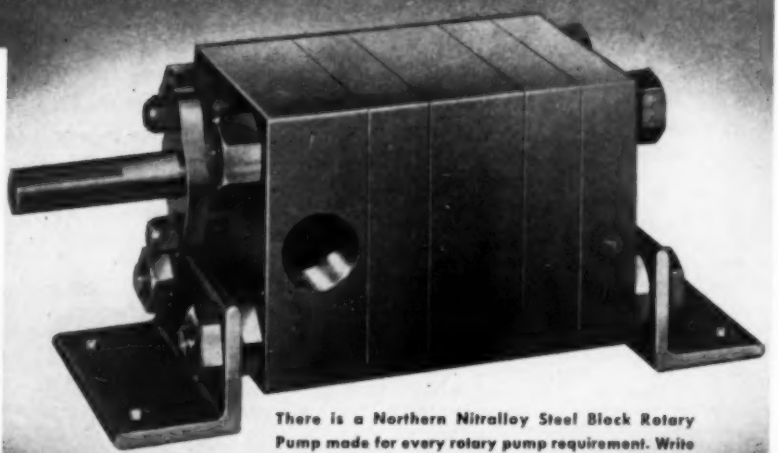

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PACKAGING MACHINES

Use of Pneumatics on Packaging Lines. E. D. S. BAKER. Packaging Rev Jan, Feb, Mar 1955. Use of controlled, pressure air, or vacuum, to hold, clamp, move or actuate, through medium of jets, orifices, air cylinders, vane type motors, and turbines. Jan: Desirable features; uses of vacuum. Feb, Mar; Example of system giving 50-psi pressure and 30 cfm of free air, with line holding vacuum at 29 in. Hg to 20 cu. ft. reservoir.

Shop-Built Box Former Saves $1200 a Year. Applied Hydraulics Dec 1954. Air powered cardboard box forming press.

Air Operated Turnover Pays Off in 11 Weeks. Applied Hydraulics July 1954. Simple positioning fixture used for packaging television sets.

Air Powered Jig Tilts and Turns for Packaging Operation. Applied Hydraulics June 1954. Handling of wire bound boxes is explained.

Air Powered Strapping Machine Reduces Handling Costs. Applied Hydraulics May 1954. Large packages are wire strapped; electrical and air circuits are described.

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Fast Setup—Short Run Efficiency. W. C. OBEREM. Applied Hydraulics June 1951. Eighteen limit switches control feeding, scoring and cutting of corrugated cardboard on box making machine.

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Milk for Half Million. R. G. SKERETT. Compressed Air Mag Apr 1947. Bottling and processing; air operated equipment.

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PACKINGS

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O-Ring Maintenance. R. G. DEMPSEY. Applied Hydraulics Oct 1955. Techniques for applying and replacing O-rings.

Dynamic Sealing. C. JOHNSON. Machine Design Aug 1955. Selection and application of O-rings in industrial equipment; maintenance.

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Fluid Seals. R. H. BARBOUR, R. O. ISENBARGER, Soc Automotive Engrs—Paper n 467 for meeting Mar 1-3 1955. Relation of pressure and speed on rotating shaft seal; comparison of various synthetic rubbers with leather; causes of failure; sealing problems in hydraulic applications; automobile applications.

Low-Friction Fluid Seals. Engineering Feb 4 1955. Packing is virtually "drop-tight", and offers little resistance to operation of hydraulic ram.

O-Ring Design Factors. Mech World Feb 1955. Data in tabular form for rapid static or dynamic application to flange, shaft, or piston seals.

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Rubber and Leather Can Be Bonded to Die Castings for Oil Seals. Precision Metal Molding Jan 1953. Bonding rubber and leather to zinc die casting; two seals and bonding operation described.

How to Prevent Oil Seal Failure. R. O. ISENBARGER. Product Eng Jan 1953. Oil seal failure; check list for fluid seal specifications; effect of operating condition on specifications; installation practice.

Factors in Designing for Mechanical Seal Applications to Hydraulic Equipment. J. B. STEVENS, H. F. Greiner. NCIH Proc v VII 1953.

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How to Choose the Proper Packing. H. C. MATHEIS. Applied Hydraulics Sept 1950. Types of seals; factors affecting installation.

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Hydraulic Packings and Seals. C. E. SCHMITZ. NCIH—Proc v II 1948. Materials; types; testing; fluids; application.

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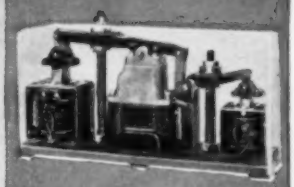
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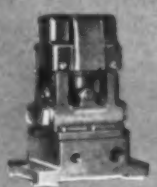
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Gasket Design and Selection. H. H. DUNKLE. NCIH—Proc v II 1948. Gasket characteristics; gasket factor; operating conditions; flanged assemblies; installation; construction.

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Development of Hydraulic Seals. W. W. HAGERTY. NCIH—Proc v I 1947.

Selecting Operating Pressures for Hydraulic Systems. H. FIELD, Jr. Product Eng Feb 1946. Pressure selection for low, medium, and high pressure systems; size of units and available packings, pumps, cylinders and valves.

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Injection Molding of Rubber Parts. Iron Age May 16 1946. Features and performance of molding machine.

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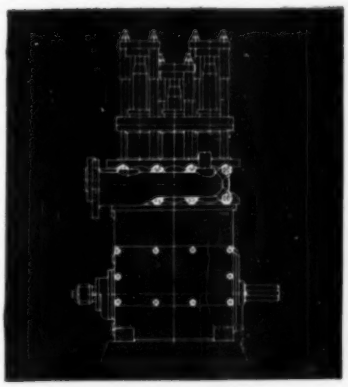

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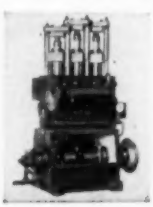

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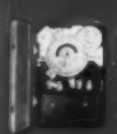

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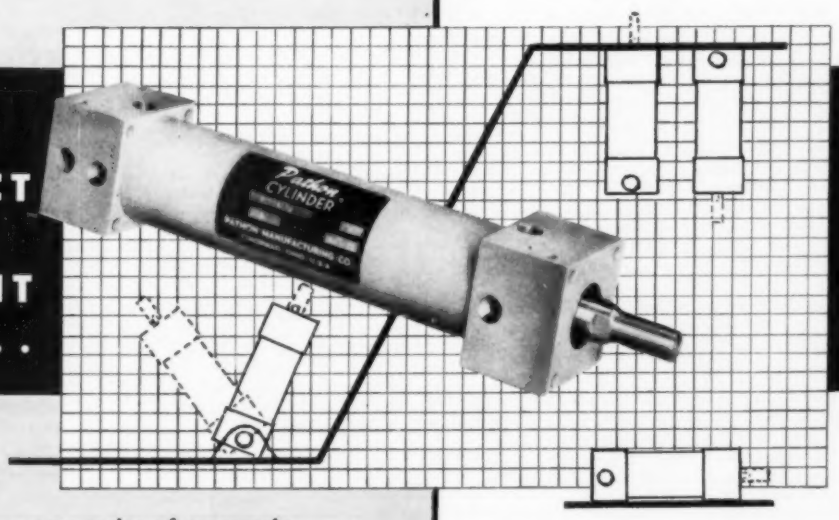

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PH312E	3"	12"	1-1/8"	1500	" "	"	42.50
PH341	3"	4"	1"1/8"	1500	Inserted	"	32.50
PH381	3"	8"	1-1/8"	1500	"	"	35.00
PH45E	4"	5"	1-1/8"	1500	External Threaded	18,750 lbs.	37.50
PH46E	4"	6"	1-1/8"	1500	" "	"	39.50
PH48E	4"	8"	1-1/8"	1500	" "	"	43.50
PH410E	4"	10"	1-1/8"	1500	" "	"	47.50
PH412E	4"	12"	1-1/8"	1500	" "	"	51.50
PH45E3	4"	5"	1-1/2"	3000	" "	37,500 lbs.	52.50
PH46E3	4"	6"	1-1/2"	3000	" "	"	54.50
PH48E3	4"	8"	1-1/2"	3000	" "	"	58.50
PH410E3	4"	10"	1-1/2"	3000	" "	"	62.50
PH412E3	4"	12"	1-1/2"	3000	" "	"	66.50
PH518I	5"	18"	2"	3000	Inserted	59,250 lbs.	85.00
PH524I	5"	24"	2"	3000	"	"	107.50
PH530I	5"	30"	2"	3000	"	"	130.00
PH636E	6"	36"	2"	3000	External Threaded	86,625 lbs.	265.00

4-WAY, OPEN CENTER HYDRAULIC CONTROL VALVE

Has built-in adjustable relief valve, set at 1000 PSI with a spring loaded neutral position. Used for controlling (1) double action cylinder of the types shown in this advertisement. Can also be mounted in series. Has 3/4" standard pipe inlet & outlet ports. 1/2" pipe thread cylinder port. Shipping weight 10-1/2 pounds. . . . . **21.50 NEW**

NEW-HEAVY DUTY HYDRAULIC CYLINDER

A rugged, heavy duty cylinder. All steel construction. Double action. Has 7" bore, 13" stroke. 2½" steel shaft. Ideal for use in hydraulic presses, leveling ramps, hydraulic tail gates, industrial machinery, road machinery, etc. Shipping weight 180 pounds. . . **95.00**

GB-8-25 TON HYDRAULIC CYLINDER
Same as above except has 8" bore, 15" stroke. Will give 50000 lbs. thrust at 1000 PSI. Shipping weight 185 lbs. **105.00**

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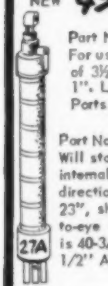
SURPLUS HYD. CYLINDERS

Gov't Surplus Bargain. Produces up to 40,000 lb. thrust with a 3000 PSI line pressure. May also be used as a low pressure air system cylinder. Has a 4" bore, 18" stroke, 30½" length. Part No. 29. New & Used.
NEW **43.95** USED **29.95**



Part No. 27A. Finest Surplus. For use up to 1500 PSI. Has bore of 3½", stroke 21-5/8", shaft 1". Length 29¾". Ports 3/8" AN pipe. **35.77**

Part No. 27B. Similar to above. Will stand up to 2000 PSI. Has internal stroke cushion in both directions. Bore 3-7/8", stroke 23", shaft 1-3/8", eye-to-eye length closed is 40-3/4". Ports are 1/2" AN pipe. **45.00**

Part No. 27C – Similar to 27A above. Take up to 1500 PSI. Has 3-1/2" bore, 23" stroke, 1-1/2" shaft, 34" closed lgth. 1/2" AN pipe ports. **45.00**

HYD. HAND PUMP **12.75**

Top condition. Has operating pressure of 1500 PSI. Capacity of 1.5 cu. in. per complete cycle.

HYD. HOSE & TUBING

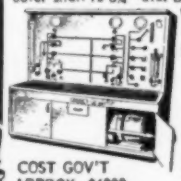
We stock a complete line of Hydraulic Tubing and Hose as well as all types of fittings and hardware. Send us your requirements.

TELESCOPING HYDRAULIC CYLINDER

Thrust shaft is in two stages. First stage extends 39" – the second stage extends 18". Each stage works seperately. The overall length eye-to-eye is 61½". Inner shaft is 2-3/4" dia. outer shaft is 3¼" dia. Bore is 4¼". Ports are 1/2" AN pipe. **165.00**

NEW 10 TON HYDRAULIC PRESS

Here is a rugged 10 TON Arbor Press you can use in the shop or take with you on the job. Has sturdy frame of 4" welded channel iron. Press has 4-1/4" stroke, 2-1/2" diameter ram. A control valve operates the piston in both directions. Platform is adjustable. Has positive power Hand Pump. 2000 PSI pressure gauge. NEW **129.00**



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Electric motor driven type. Has a 2500 PSI Hydreco Pump which delivers up to 10 GPM. Powered by 15 HP, 3 phase motor using 220/440 volt, 60 cycle current. Unit has selector valves, pressure gauges, flow meter, reservoir, heat exchanger and filter pressure regulator. Mounted on steel frame. Has work bench, flourescent lights and hand operated, high pressure pump for testing to very high pressures. Overall size: 8ft. long x 7ft. high x 4ft. deep.

HYD. TEST STAND – Same as above but has a Reeves variable speed reducer to control the pump output as desired. **$1695**

NEW SURPLUS VICKERS HYDRAULIC TRANSMISSION

Self-contained, constant torque at all speeds with variable volume, reversible piston pump which supplies hydraulic motor. Has 2 H.P. automatic pressure dash pot for smooth control. Power output RPM is 0 to 1/3 input RPM in both directions. Input RPM 1800 continuous, 4000 intermittent. Ideal for Lathes, Duplicator set-ups, Conveyors, Drives, etc. . . . **44.50**

4" SPLINE SHAFTS for input and power take-off on above. **$2.50 pair**

INPUT & TAKE-OFF PLATE ASSEM. To adapt trans. to pulley drive. Has high speed bearings and 1/2" keyway shaft. Per Set **20.00**

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Made to top Aircraft specifications. RPM shown below is the recommended maximum for constant speed. Quantities limited.

HYDRAULIC PUMPS Part No.	Cu in. per rev.	GPM	PSI	RPM	PRICES NEW	USED
PF9-713-20BCE	.410	5.3	1000	3000	—	$20.00
PF9-2713-20ZE	.410	5.3	1500	3000	$24.50	—
PF9-2713-10Z	.208	2.7	1500	3000	$29.75	$22.50
PF2-713-25BCE	.507	6.5	1000	3000	$32.50	$22.50
PF50-3915-30YG	1,520	19.7	3000	3000	—	200.00
HYDRAULIC MOTORS						
MF9-713-15A	.310	4.46	1000	3750	—	$18.50
MF9-713-30BCF	.600	9.75	1000	3750	$37.50	
MF9-713-25BCF	.507	8.25	1000	3750	—	$22.50

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A gear type pump. Will deliver 2 GPM at 1500 RPM with 1500 PSI – delivers 6 GPM at 4300 RPM with 1500 PSI. Has .375 cu. in. displacement per rev. Ports are 3/4" standard pipe. 5/8" male spline drive shaft. 4" pad mount. In good condition. **14.95**

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Designed and built to finest aircraft specifications.

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SP-3	2	1400	3750	NEW $27.50
67WF300	3	1500	4500	USED 72.50
67WJ800	8	3000	4500	USED 87.50

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PNEUMATIC SYSTEMS
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43-Year-Old Air Compressors Still Serve Quarries. Compressed Air Mag Jan 1946. Maintenance case history of two air compressors and put in service in 1903; other pneumatic operations.

Audels Pumps, Hydraulics, Air Compressors. F. D. GRAHAM. Audel & Co 1946. (Book).

Installation and Maintenance of Compressed Air Plant. W. J. ROBERTS. Power & Works Engr Sept 1945. Layout of compressed air equipment; points affecting installation; notes on overhaul and maintenance.

Small Air Units Solve Expansion Problems. R. P. ENINGER. Mill & Factory Aug 1945 Use of small air compressors to form individual air systems.

Compressed-Air Layout Anticipates Future Demand of Colliery. W. B. WILLIAMS, G. E. SMITH. Coal Age Aug 1945. Equipment and layout of compressed air system.

Elements of Pneumatic Installation. J. C. DOTNER. Tool Engr May 1945. Installing air compressors, receivers, distribution lines; condensation removal.

Air Used By Pneumatic Tools. Factory Mgmt & Maintenance Dec 1944. Table of air consumption of common tools at 90 psi.

Air Power Decentralized. R. P. ENINGER. Mill & Factory Dec 1944. Use of departmentalized air.

Cooling-Water Temperature Control for Air Compressors. Engineering Nov 3 1944. Description of automatic control apparatus for maintaining jacket cooling water of medium and larger sized air compressors at constant and optimum temperature.

Efficient Utilization of Compressed Air in Foundry. J. L. YATES. Foundry Oct 1944. Compressed air plant; receiver design; distribution; maintenance.

Importance of Air Compressor. E. S. RIVETT. Modern Power & Eng Sept 1944. Proper maintenance and operation of air compressor plant.

Starting-Up Air Compressor. D. BRAID. Mech World Apr 7 1944. Procedure in new installation and overhaul; proper lubrication; properties of oil; overheating; lubricators; cooling water; direction of rotation; obscure causes of heating; stage pressures and temperatures.

Pneumatic Systems and Controls in Mechanical Design. E. E. HEWITT. Product Eng Mar 1944. Systems and valving for control of force, movement, sequence, timing; schematic diagrams of valve and piping arrangement.

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Precautions in Air Compressor Plants. H. H. MILLER. Southern Power & Industry Jan 1944. Precautions in operation of air compressor plant; leakage, lubrication, starting and breaking in new compressor; installation of aftercoolers; inspection of compressor valves; air receiver connections.

Solid Drawn Steel Air Receivers. Brit Standard Instn—Brit Standard 430—1944. Material; dimensions; tests; marking; etc.

Let's Compare Compressed-Air Fuel Costs. Power Nov 1943. Tables and notes for computing fuel or power costs for selection of drive for air compressor; steam engine, Diesel engine, gasoline engine, gas engine and electric motor drives compared; distribution losses.

Engineering Air Compressor Installation. Mill & Factory Oct 1943 (see also Petroleum Engr Nov 1943). Installing air compressor; location; foundation; air intake; air discharge pipe; safety valve; circulating water; steam exhaust (steam driven).

Installation and Maintenance of Air Compressors. D. BRAID. Mech World Oct 22 1943. Selection and arrangement of air compressor sites; cost, performance, and maintenance.

Design and Maintenance of Compressed Air Pipelines. Industry & Power July 1943. Piping; aftercoolers; receivers; location of shut off valves; air leaks.

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Promise". Steel July 12 1943. Compressed air equipment; pipe lines serve 300,000 sq. ft. of floor space.

Before You Select Air-Compressor Drive. C. G. KOHL. Power June 1943. Important points that should be analyzed before making selection.

Compressed Air for War Production. E. W. FELLER. Power Apr 1943. Selection of new compressors and efficient operation of existing compressor capacity; what happens when air is compressed; compressors and auxiliary equipment; how to operate and maintain compressed air system.

More Storage Capacity Reduces Compressor Load. G. C. TUCKER. Power Feb 1943. How power costs were reduced by installing air receivers.

Valves, Gauges and other Safety Fittings for Air Receivers and Compressed Air Installations. Brit Standards Instn—Brit Standard M 1123 1943. For pressures not exceeding 1000 psi.

Small Fusion-Welded Steel Air Receivers. Brit Standards Instn—Brit Standard m 1099-1943. For receivers with less than 9-inch internal diameter and pressure less than 250 psi; quality; construction; inspection; test.

Underground Air Receiver in Coal Seam. T. MURPHY. Compressed Air Mag Dec 1942. Construction of underground air receiver; chamber excavated in coal seam; details of bulkhead.

Installation of Air Compressors. Machy (Lond) Nov 26 1942. Hints relate to compressor fitted with aftercooler.

Getting Most Out of Your Air Tools. Compressed Air Mag July 1942 (see also Steel Sept 7 1942). Air compressor plant layout, piping system, etc.

Fundamental Relations of Compressed Air. M. S. COLE. Nat Engr May 1942. Volume, pressure, and temperature in compression and expansion of air; air compressor formulas and calculations; inter-cooler pressures as check on efficient operation; water consumption of air compressor.

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Condensation in Compressed Air Piping. G. M. BROWN, C. FOSTER. Heating, Piping & Air Conditioning Sept 1941. Chart for visualizing relation between formation of water vapor and prevailing pressure and temperature conditions in compressed air systems.

Rock-Hewn Receiver Deep Underground. Compressed Air Mag July 1941. Description of compressed air receiver of mine.

Some Temperature Effects with Compressed Air. A. L. EGAN. Engineering June 6, July 4 1941. Examples to prove expanding compressed air from disconnected container produces coldness.

Pneumatic Tools. Aircraft Production May 1941. Layout of compressed air system.

Underground Rock Air Receiver. C. PENGILLY. Inst Min & Met—Bul Feb, Mar 1941 (see also Iron & Coal Trades Rev Feb 21 1941). Colliery Guardian Feb 28 1941). Description of receiver at mine.

Compressor Plant Modernization Pays for Itself Out of Savings. W. J. CRABBS, Jr. Power Aug 1940. 2650-cfm compressor with aftercooler and improved cooling water system.

Some Suggestions on Transmission of Compressed Air. W. S. WEEKS. Eng & Min J Oct 1939. Discussion of flow of air in pipes; formulas for pressure drop in pipes; turbulent flow; high pressure ventilation work formula.

Construction Design Chart—SLIV. J. R. GRIFFITH. Western Construction News Aug 1939. Estimating pressure loss in compressed air lines; examples.

Hanging Up Air Receiver. H. M. SPRING. Power June 1939. Mounting various types of receivers.

Loss of Pressure Due to Flow of Compressed Air in Mains. A. S. FORD. Colliery Eng Aug 1938. Chart to determine pressure drop.

Sizing Pipe for Compressed Air. J. M. BARTHOLOMEW. Power May 1938. Pipe sizes for air at 100 psi.

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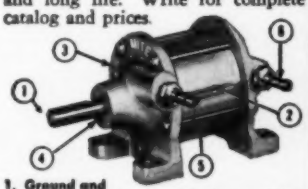

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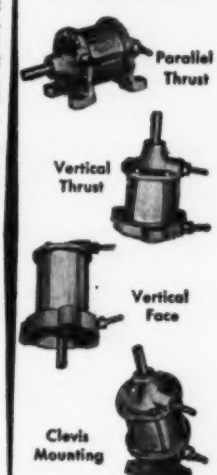

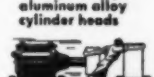

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PNEUMATIC SYSTEMS
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Installation and Maintenance of Compressed-Air Plant. S. YOUNG. Power & Works Engr July 1937.

Compressed Air. Power Dec 1936. Graphs showing horsepower required to compress 1000 cfm; volume of compressed air relative to free air; weight of water in 1000 cu. ft. of saturated air; pressure drop due to friction.

Check Compressed Air Piping to Stop Waste, Excessive Cost. A. W. LOOMIS. Heating, Piping & Air Conditioning Sept 1934. Location of intake, aftercoolers, and receivers; pipe size; leaks.

Compressor Data. Power July 1934. Horsepower required to compress 1000 cfm air at atmospheric pressure.

Design of Compressed Air Piping for Industrial Power Plants. H. C. MOFFETT. Power Plant Eng Aug 1933.

Between Compressor and Face, Distributing Air Underground. L. EATON. Eng & Min J July 1933. Design of compressed air lines in mines.

Design of Compressed Air Piping for Buildings. Heating & Vent June 1933.

Production and Use of Compressed Air. R. JAMES. Iron & Coal Trades Rev Mar 3, Mar 10 1933. Increasing efficiency; moisture; lines; leakage.

Compressed Air Supervision an Engineering Task. P. ERIMESCU. Eng & Min J Apr 1932. Efficiency of compressed air power transmission.

Some Notes on Compressed Air. F. J. TAYLOR. Mech World Mar 11 1932. Pipe sizes; joints; packing; pressure drop; moisture.

Compressed Air. F. D. HARTFORD. Factory & Indus Mgmt June 1931. Use of compressed air in industrial plants; qualities required; selection of equipment; method of calculating cost.

Compressed Air Distribution. Power Plant Eng Jan 1 1931. Air-flow calculation; velocity, pressure, and quantity of flow; loss of pressure in transmission; pressure, temperature, and weight relations.

Compressed Air Storage. Power Plant Eng Jan 1 1931. Characteristics and specifications of air receivers; use of aftercoolers; air driers; oil removers.

PRESSES

Air Regulator Controls Oil Pump Pressure. A. J. ROECKER. Applied Hydraulics Oct 1955.

New Forging Press for Boiler Drums. Shipbldg & Shipg Rec Aug 4 1955. Characteristics of 2000-ton press; pressure is applied by two main rams and four auxiliary rams.

Deep Drawing of Nimonic 75 and Stainless Steel. Sheet Metal Industries Aug 1955. Design and operation of hydraulically operated press.

Air Force Reaches Half-Way Point in Heavy Press Program. Iron & Steel Engr May 1955. Two hydraulic forging presses of 35,000 and 50,000 ton capacity; forging operations and heat treating; design and construction details of presses.

Oil Driven Water System for Forge Shop Presses. S. J. KILLA. Applied Hydraulics May 1955. Reduced maintenance and greater safety are the results of hydraulic circuitry.

Complex Rotary Printing Presses Simplify Setup. H. CASSELL. Applied Hydraulics Mar 1955. Hydraulic cylinders are used to position color rolls on multi-color press.

5000 psi Hydraulic Components Simplify Extrusion Press Design. L. R. HOFFMAN. Applied Hydraulics Feb 1955. Two 35-gpm fixed displacement piston pumps power 1000 ton press.

Trends in Hydraulic Control Techniques for Heavy Presses. L. MOLLICK. NCIH Proc v IX 1955.

Design of Hydraulic Straightening Press Assures Accessibility for Maintenance. Applied Hydraulics Dec 1954. Differential circuit provides rapid closing; bypass valve opens when press is closed to switch operation from differential to conventional to obtain maximum tonnage.

Pneumatic Power Applied to Metal Forming Machinery. S. M. DOLNEY. Tooling & Production Nov 1954. Description of application of compressed air to single and double wing sequence press, press brakes, and radial draw formers.

Small Hydraulic Presses Do Yeoman Work. R. H. BEHREND. Am Mach Oct 25 1954. Design and controls of C-frame, open gap press.

Single Stroke Compacting Press . . . New Ram Application. C. C. FISHBURNE. Applied Hydraulics Oct 1954.

Inverted Press Design Simplifies Use of Auxiliary Cylinders. Applied Hydraulics Aug 1954. A 5 to 1 booster is used on 100-ton forming press.

7,000 Ton Forging Press. H. ULMANN. Eng J May 1954. 7000-ton press; tools; three triple plunger pumps for supplying high pressure fluid to press.

Swaging Machine for Armature Wires. Engineering Apr 2 1954. Riveting hammer converted to pneumatic punch.

Can Shop-Built Air Presses Assemble Your Product? T. JEFFREY. Applied Hydraulics Apr 1954.

Floating Cushion Protects Dies from Overload. R. SOMAN. Applied Hydraulics Apr 1954. Air-to-oil pressure booster as press cushion minimizes die damage caused by double loading.

Hydraulic Piercing Tools Increase Production 400%. Applied Hydraulics Apr 1954.

Rubber Pad Press Gets New Muscles. Steel Mar 22 1954. Working pad is displaced down over work by pumping hydraulic oil into fluid cell.

Simplified Valving. L. ZIMMERMAN. Applied Hydraulics Feb 1954.

Hydraulic Presses of 9, 20 and 50 Tons. Engineering Jan 8 1954. Light presses having control device which limits working pressure during any stroke to preset value.

Thyratron Control of Air Pistons. R. L. ALCORN, Jr. Elec Mfg Jan 1954. Stock is between two rams which must be synchronized; electronic circuits function through solenoid valves; circuit diagrams.

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The Verson-Wheelon Direct Acting Hydraulic Press. G. F. ROHRSCHEIB. NCIH Proc v VIII 1954. Hydraulic circuit; decompression problem.

Pneumatic Counterbalancing of Mechanical Presses. Applier Hydraulics Dec 1953. How to select air cylinders to counterbalance press slide weight.

Some Problems in Development of 50,000 Ton Press. H. C. HOOD. Steel Processing Dec 1953. Power for press operation supplied by hydropneumatic accumulator system; effective ventilation.

Hydraulic Machines for Producing Refrigerator Components. Machy (Lond) Nov 20 1953; Jan 22, Jan 29 1954.

Steam-Hydraulic vs. Hydraulic Forging Press. V. TATARINOV. Steel Processing Nov 1953. Performance of 600-ton hydraulic press and 600-ton steam hydraulic press compared.

Design of Hydraulic Systems for Heavy Presses. A. GREENSITE. Applied Hydraulics Oct, Nov, Dec 1953. Oct: Power station. Nov: Valves. Dec: Control circuits. Circuit details for forging and extrusion presses powered by water and developing forces up to 50,000 tons.

Hydraulic Problems of Large Forging Presses. E. V. CRANE, W. R. JACKSON. NCIH Proc v VII 1953

Oil Temperature Control on 1000 Ton Rubber Curing Presses. R. L. GUGGENHEIM. Applied Hydraulics Aug 1953.

Double Purpose Press. Metal Industry Aug 21 1953 (see also Sheet Metal Industries Aug 1953). Two separate hydraulic actions; construction of press.

Lasco Electro-Hydraulic Presses and Hammers. Machy (Lond) July 24 1953. Presses and hammers electro-hydraulic operation; drop hammer models described and operation explained.

Hydraulic Lever Clamps Press Die. E. W. FRIEDL. Applied Hydraulics July 1953. Clamping pressure is applied from bottom of 50-ton mechanical press;

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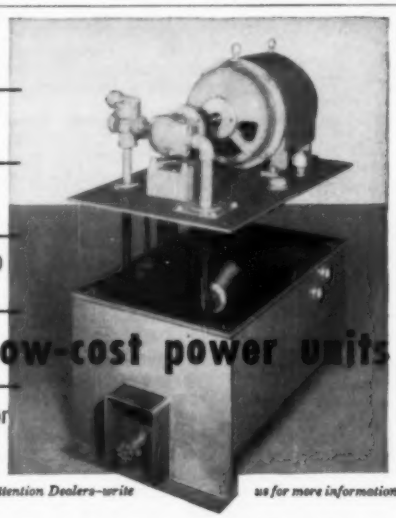

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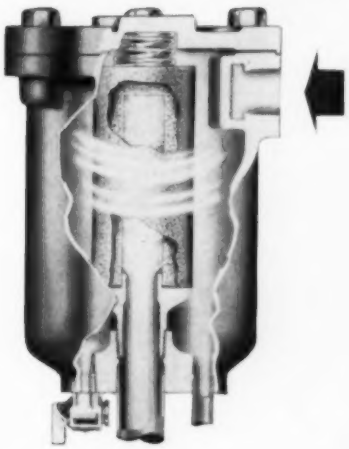

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Colossal Press Spearheads Lockheed's Skin Program. R. B. SCOTT, R. L. VAUGHN. Machy (NY) July 1953. 8000-ton hydraulic triple-action press.

Air Force Heavy Press Program Moves from Planning Board into Fabrication. A. S. COHAN. J of Metals May 1953. Eight aluminum forging presses ranging from 25,000 to 50,000 tons; specifications.

12,000-Ton Hydraulic Press for Aluminum. Engineering Mar 6 1953 (see also Engineer Mar 6 1953, Machy (Lond) Mar 6 1953, Metal Treatment & Drop Forging Mar 1953; Light Metals Mar 1953; Steel Processing Apr 1953; Aircraft Production Apr 1953). Forging press is designed to work at total pressures of 4000, 8000 or 12,000 tons.

Higher Press Tonnages. Applied Hydraulics Mar 1953. Proposed 75,000 ton press housed in monolithic concrete structure.

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Air Pressure Assembles Tiny Switches. P. R. ENZLER. Am Mach Feb 16 1953. Bench press inserts and heads silver contacts; riveting operation described.

Hydraulic Press and Drawbench Installation in America. Engineer Jan 23 1953 (see also Machy (Lond) Jan 9 1953). 6000-ton press bends plate sections up to 42-feet long, and 1100-ton drawbench produces sections up to 35-inches outside diameter.

Big Presses Tax Design Ingenuity. M. D. STONE. Iron Age Jan 8 1953. Size and capacity of heavy presses; features of hydaulic components.

General Facts About 35,000 and 25,000 Ton Forging Presses. E. A. IRWIN. Machine & Tool Blue Book Jan 1953. Design features of 35,000-ton press; details of hydraulic system and pumps.

Control Valves for Direct Hydraulic Presses. F. H. TOWLER, J. M. TOWLER. Inst Mech Engs—Proc 1953 (see also Machy (Lond) Feb 6 1953 Am Mach July 6 1953).

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Rocket Costs Reduced by Hot and Cold Forming. Applied Hydraulics Apr 1952. High pressure, differential circuit design.

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Hydraulic Press for Large Aircraft Components. Engineering May 25 1951. Press can be set to very fine limits; capacity of 500 tons as double action, or 750 tons as single action.

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Electro-Hydraulic Production of Cranks. Can Metals Feb 1950 (see also Can Machy Apr 1950). Machine has resistance heating to raise temperature of rod; five bends in one operation hydraulically.

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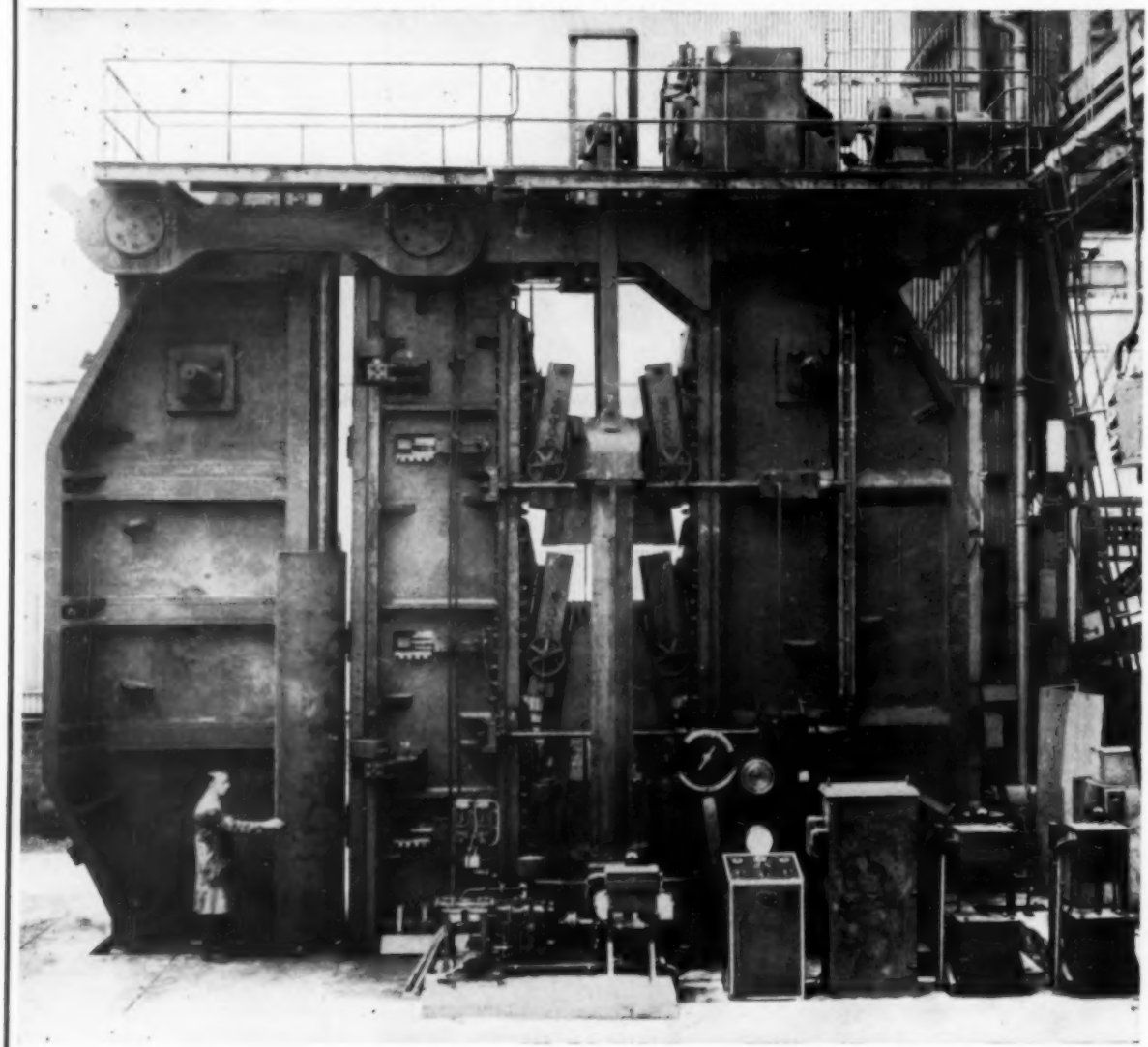

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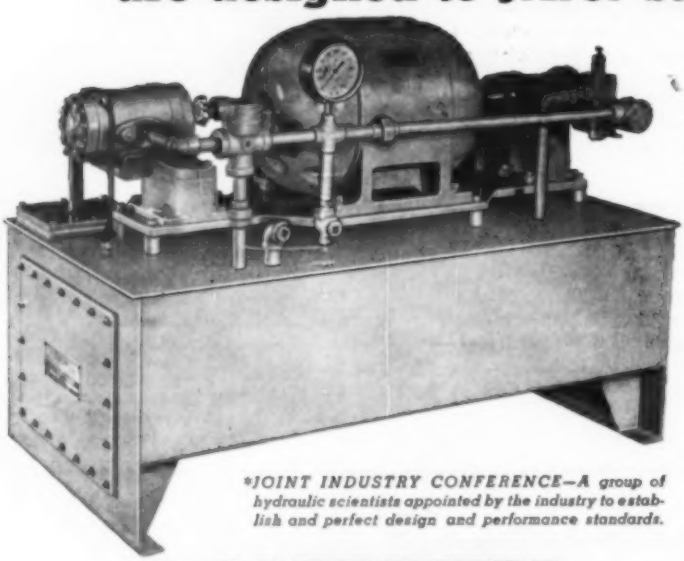

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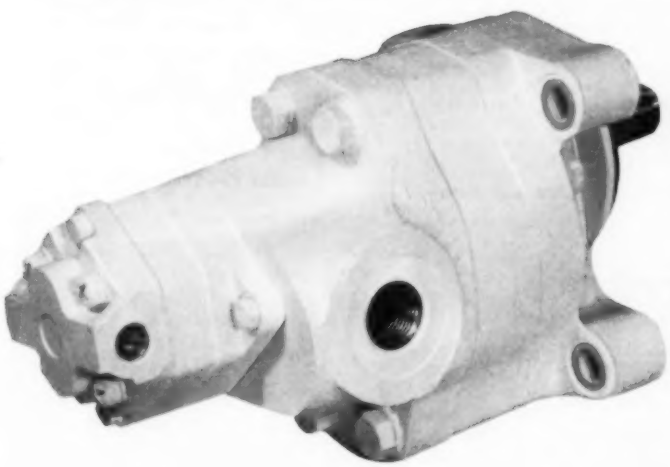

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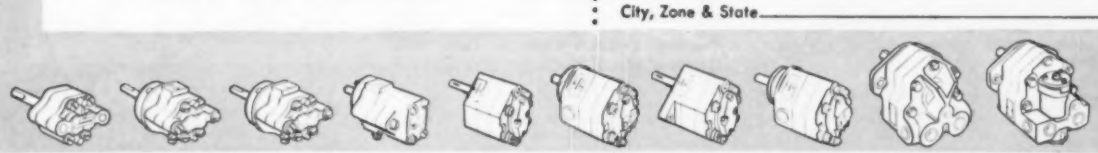

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RAILROAD EQUIPMENT

converted to duplex oil system; circuit diagram.

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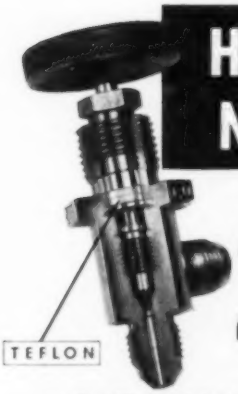

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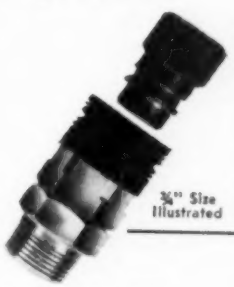

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Cyl. Dia. Bore	STOCK STROKE LENGTHS — All Double Acting								
	1"	2"	3"	4"	6"	8"	10"	12"	15"
1½"	24.16	25.72	26.08	26.44	27.16	27.88	28.60	29.32	30.40
2"	26.24	27.88	28.32	28.76	29.64	30.52	31.40	32.28	33.60
2½"	32.36	34.12	34.68	35.24	36.36	37.48	38.60	39.72	41.40
3"	35.04	37.28	37.92	38.56	39.84	41.12	42.40	43.68	45.60
4"	40.84	43.68	44.52	45.36	47.04	48.72	50.40	52.08	54.60
4½"	48.96	51.92	52.88	53.84	55.76	57.68	59.60	61.52	64.40
6"	66.60	70.80	72.20	73.60	76.40	79.20	82.00	84.80	89.00
8"	———	126.80	129.20	131.60	136.40	141.20	146.00	150.80	158.00

• Basic mountings "A" and "E" (see above) convertible to "B", "C", "D", or "F" (see below) by changing heads. Add 10% to above list prices (no extra charge for 8" bore.) • Piston rods have B-1, NF male thread. • Cushioning can be eliminated on either or both ends by removing spring and ball-check.

NOTE: Class 1 cylinders listed, for Air or Oil to 300 psi. Water use requires 1 week delivery for chrome plating of steel components.

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SPEED CONTROL

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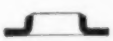

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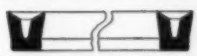

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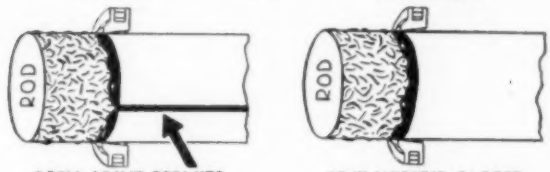

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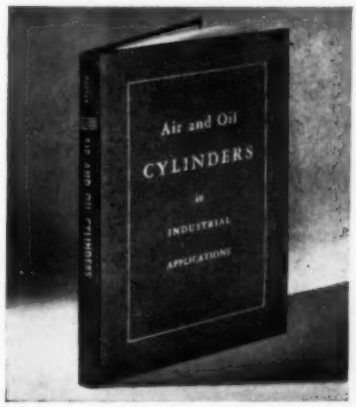

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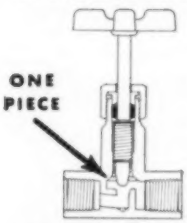

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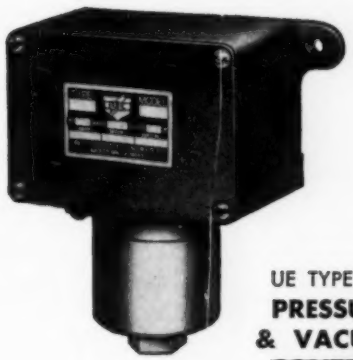

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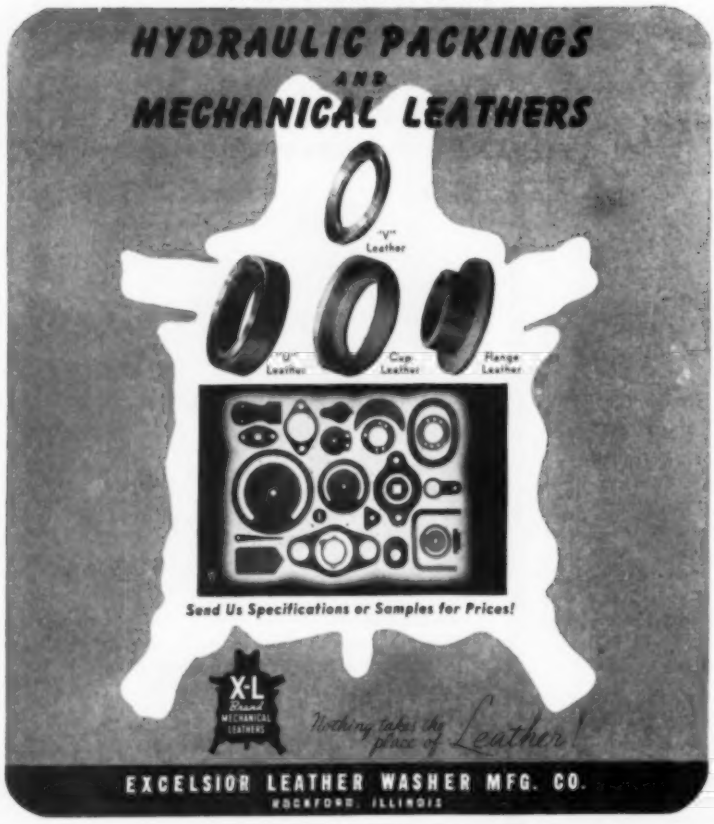

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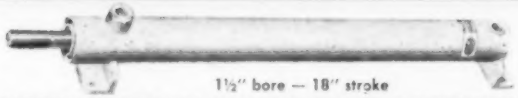

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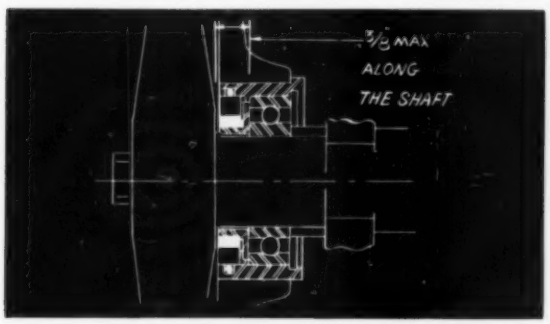

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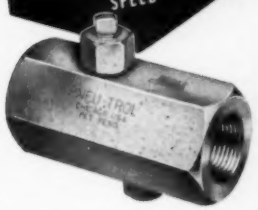
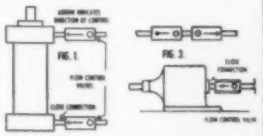
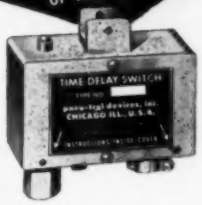


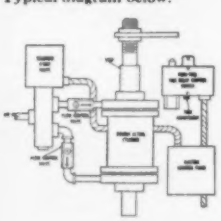
Pneu-Trol Valves combine in a short, compact body, a tapered fine thread needle for extremely accurate air or oil flow control, and a floating retro ball check, which permits full flow in the opposite direction. Design provides close regulation in one direction, full flow in opposite direction. Available in 5 female pipe sizes—⅛" to ¾". Valve bodies made of brass, aluminum, steel or stainless steel.



TIME DELAY CONTROL SWITCH FOR PRECISE DELAY OF WORK CYCLE



Provide controlled adjustable time dwell of solenoid operated air or oil supply valves. Range between ¼ and 60 seconds in 20 to 1 ratios. Compact—simple—foolproof—rugged. Easily mounted on machine. Available for various types of actuation. Typical diagram below.



Pneu-trol DEVICES, INC.
Components for Automation
1426 N. Keating Ave., Chicago 51, Ill.

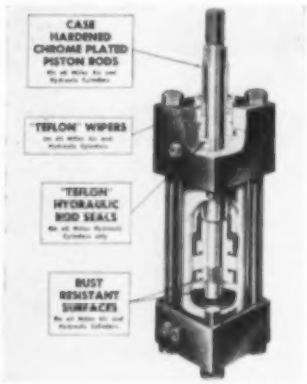
Circle 133 on Reader Service Card

New Products continued

AIR AND HYDRAULIC CYLINDERS

. . . incorporate new standard features

Design: To provide longer cylinder life, improved performance and wider usage, the following design features were adopted as standard specifications. Case-hardened,



chrome plated piston rods, Teflon rod wipers, Teflon hydraulic rod seals, and high quality black ferric oxide surfaces. The Teflon wipers may withstand temperatures from —10 degrees F to +500 degrees F. The black oxide finish provides rust protection in air cylinder operation and on all others during shipping and installation.

Miller Fluid Power Company
Melrose Park, Ill.

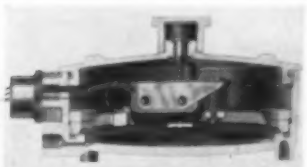
Circle 208 on Reader Service Card

PRESSURE SWTCH

. . . operates in any position

Designation: Pressure Switch 227

Features: This diaphragm pressure switch accurately senses a pres-



sure difference from 0—45 inches of water between a variable and a reference pressure, with a fixed actuation value of .5 inches of water. The switch will actuate an electric circuit on an increase or decrease of a predetermined pressure difference. It can be readily adjusted by means of an external adjustment screw for field setting. Unit is not sensitive to jarring and vibration, and tamperproof external adjustment keeps it from accidentally being disturbed. A splash-proof housing protects the entire mechanism in exposed installations.

Barksdale Valves
Los Angeles, California

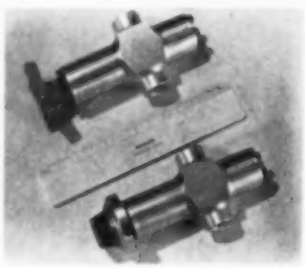
Circle 209 on Reader Service Card

METERING VALVE

. . . controls wide flow range

Designation: R-149A

Features: Valve is hydraulically balanced and requires very low turning torque and will throttle to very low rates of flow. Over the entire range of controllable flow, the regulation of the flow is held to very small limits. A valve with 3/8 inch tubing ports will control from drops per minute to 25 gpm at 3000 psi pressure drop across the



valve. Range, or ratio of maximum to minimum controllable flow, can be provided up to 100,000 : 1.

Specifications: A variety of materials can be used to meet needs of various fluids and temperatures. Bodies and internal members can be furnished in combinations of aluminum, bronze, stainless steel, alloy or carbon steel. Operating pressures up to 3000 psi is standard, higher pressures can be provided for. Basic design of this unit permits the inclusion of a very small electric motor to provide a fully motorized modulating valve.

United Hydraulics, Inc.
Dayton, Ohio

Circle 210 on Reader Service Card

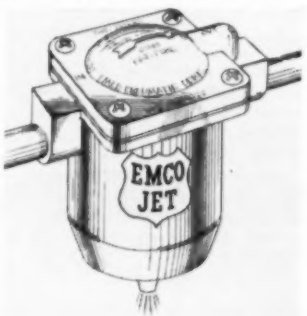
AIR FILTER

. . . handles from 1 to 20 CFM

Designation: Emco Jet L200A

Features: New, compact, completely automatic unit weighs only 12 ounces, the major parts are made of light weight aluminum instead of brass and requires no manual adjustment.

Operation: The automatic filter operates by the differential of pres-



sure. Sudden stoppage of air flow causes the internal valve to change position. During this instant, the water and foreign substances collected are jettisoned through the opening at the bottom of the separator.

Applications: Designed for industrial use in operating pressures from 60 to 250 psi air pressure.

Emco Pneumatic Corp.
Des Moines, Iowa

Circle 211 on Reader Service Card

DISCONNECT COUPLING

. . . keeps pressure drop to minimum

Design: Self-sealing, straight-through disconnect is possible by the locking action which insures safety of the connection under severe vibration conditions. Free-floating Teflon seal and flow ball combination provides maximum

sealing effectiveness when the disconnect is in the uncoupled position. The ball lock also serves as a sight-and-feel indicator, assuring that unit is completely coupled.

Features: This type coupling instantaneously converts any connec-

Continued on page 210

Circle 165 on Reader Service Card

300 DIAMETERS AND STROKES

11 TYPES PRODUCTION MADE

HyPOWER HYDRAULIC CYLINDERS

Type for type the sturdiest cylinders made — with heavier cylinder walls, piston shafts, cast steel clevises plus U-cup packing. 5 types A.S.A.E. standardized.

Turlock Iron and MACHINE WORKS
Turlock, California

GRETHER & GRETHER — Factory Representatives
P. O. BOX 47 • STOCKTON, CALIFORNIA

THE *Right* GAUGE FOR YOUR SPECIFIC NEEDS

MARSHALLTOWN

• Available in a wide variety of general purpose and special purpose gauges in pressure ranges to meet your specifications in every particular.

WRITE TODAY FOR COMPLETE INFORMATION

PRESSURE, VACUUM, COMPOUND, ALTITUDE, COMBINATION, DIAPHRAGM, HYDRAULIC, AND SPECIAL PURPOSE GAUGES, DIAL THERMOMETERS, (VAPOR TENSION OR BI-METAL)

MARSHALLTOWN MFG. CO.
800 East Nevada St., Marshalltown 4, Iowa

Circle 115 on Reader Service Card

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TEFLON

CUSTOM MOLDING IN THIN SECTIONS
an important new material for process industries with graphic illustrations and samples.

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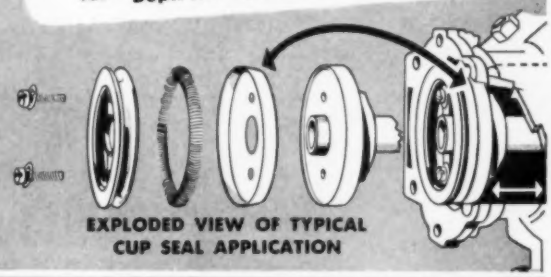
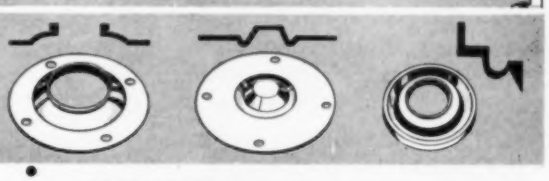
Send to: SPARTA MANUFACTURING CO. Dept. AH "Tefseal" DOVER, OHIO



EXPLODED VIEW OF TYPICAL CUP SEAL APPLICATION



TEFLON'S unique properties

combined with our technique of custom molding TEFLON in thin sections and shapes, offer important advantages in product design.

- If you have a part now made of a flexible material which will not withstand severe conditions of temperature or corrosion, TEFLON is the answer. TEFLON is chemically inert . . . heat resistant (500° F or a −100° F) . . . has a very low coefficient of friction . . . does not absorb moisture.

Our trained engineers will work with you on any application of TEFLON Cup, Ball or Shaft Seals, Washers, Gaskets or Diaphragms to meet your exact requirements.

The first cost can be the least if it is the last cost

SPARTA MANUFACTURING CO.
DOVER, OHIO
Phone: 4-2755

Circle 153 on Reader Service Card

New Products / continued

tion into a straight through line. Disconnect is operated by hand, and only one-eighth turn is required to disconnect or connect with system pressures up to 2000 psi.

Aplications: Designed for any type line which cannot tolerate pressure drop.

Specifications: Available in a variety of sizes to fit fuel and oil lines on aircraft, guided missiles, test stands and ground handling equipment. Also available with all types of configurations, including elbows and flanges.

Eastern Aircraft Products Corp.
Orange, New Jersey

Circle 212 on Reader Service Card

PNEUMATIC REGULATORS

. . . provide fast response

Designation: Governaire, Series 4000

Features: New design has superior accuracy, greater reliability, improved immunity to variations in supply pressure and ability to fill or exhaust a remote volume more rapidly. These units reveal their characteristic minimum pressure

offset effect in passing the steady state condition and the speed with which desired results are obtained on both supply and exhaust.

Applications: For pneumatic loading and gauging operations, and especially for such machine applications as welding head pressure control, punch press brake and clutch control, and cable and sheet tensioning devices.

Specifications: Available in five ranges—10, 30, 60, 150 and 250 psi high capacity ⅜ inch diameter supply and exhaust seats, three sizes —⅜, ½ and ¾ inch NPT with two ¼ inch gauge taps.

Governaire Division
Bellofram Corporation
Burlington, Mass.

Circle 213 on Reader Service Card

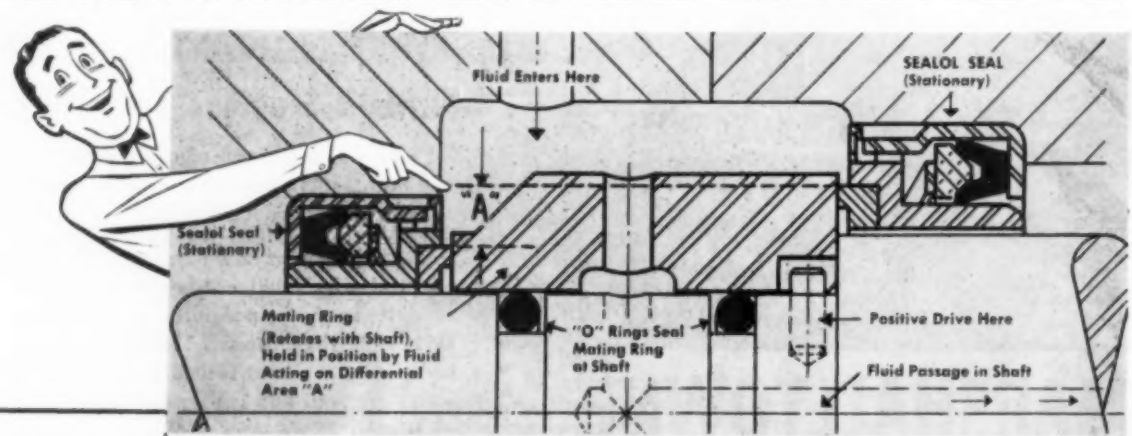
3 WAY SOLENOID VALVE

. . . features packless design

Designation: Bulletin 8316

Features: This internal pilot operated valve has just three operating parts—two hycar diaphragms and one stainless steel solenoid core. Quickly converts from normally closed to normally open operation or vice versa. Extra heavy duty construction (forged brass body and bonnet) permits up to 400 cycles per minute.

Specifications: Available in ⅜ or ½ inch pipe connections. Rated for 250 psi. Only 10.5 watts A-C



NOTE DIFFERENTIAL "A" IN THESE BUILT-IN FLUID TRANSFERS

Design engineers are constantly searching for better ways to improve their products. Sealol now offers a better way to transfer pressurized fluids . . . via this "built-in" feature . . . into a rotating shaft for actuating power cylinders, delivering coolants to drills, etc. Sealol Transfers can be utilized in high, medium, or low pressure applications . . . and definitely answer many of the problems encountered in designing automation equipment.

Sealol will gladly help you solve your fluid transfer problems. Request Bulletin No. 12 for complete Fluid Transfer data, or send us your transfer problem for engineered recommendations.

SEALOL **Sealol Corporation · 181 Post Road · Providence 5, R. I.**

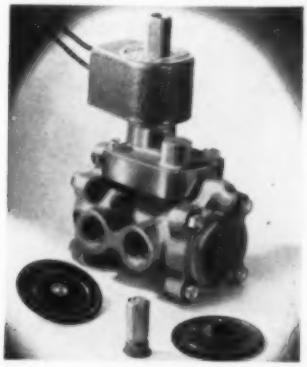
THE BALANCED PRESSURE SEAL

New York • Philadelphia • Chicago • Cleveland • Dallas
Houston • San Francisco • Los Angeles • Charleston (W. Va.)
Norfolk • Seattle • St. Louis • Tulsa • Edmonton • Toronto
Montreal • Overseas: Flexibox Ltd., Manchester, England
Flexibox SARL, Paris • Flexibox GMBH, Frankfurt

Circle 148 on Reader Service Card

or 10 watts D-C required to operate solenoid. Full ⅜ inch pressure and exhaust ports provide maximum re-cycling speed.

Applications: For securing automatic and remote control of many

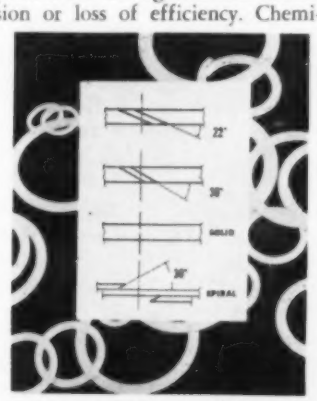


kinds of machinery, when combined with single or double acting pneumatic or hydraulic power cylinders or diaphragm operated power heads.

Automatic Switch Co.
Orange, New Jersey
Circle 214 on Reader Service Card

BACK-UP RINGS
. . . feature new design

Features: These Teflon back-up rings are made solid, and solid with 22 degrees or 30 degrees cut, as well as the spiral. These back-ups protect the O-ring seal from extrusion or loss of efficiency. Chemi-



cally inert, these new packings have very low friction.

Applications: For use in hydraulic and pneumatic applications.

Specifications: The back-up rings correspond to sizes of both MS and AN O-rings. Special sizes and variations are available to meet specific requirements. Operating temperatures range from minus 100 to plus 500 degrees Fahrenheit.

Shamban Engineering Company
Culver City, Calif.
Circle 215 on Reader Service Card

Continued on next page

TUTHILL SIMPLIFIES PUMP SELECTION

New Cataloging Plan Provides Practical Short-Cuts to Pump Specifications — Helps You Pick The Right Pump for the Purpose

If your specifications call for pumps to be built directly into the design of your equipment for . . .

- LUBRICATION
- HYDRAULIC SERVICE
- COOLANT
- TRANSFER
- CIRCULATING

In capacities from 2 to 200 g.p.m. and pressures up to 100 p.s.i.

. . . Write for Tuthill Catalog 106 on stripped model pumps

Catalog 106 shows the line of Tuthill rotary, internal-gear positive displacement pumps available in stripped form for built-in applications.

TUTHILL PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY
Dependable Rotary Pumps since 1927
939 East 95th Street, Chicago 19, Illinois

Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd. • Ingersoll, Ontario, Canada

Circle 166 on Reader Service Card

New Products continued

SHAFT SEALS

. . . for special applications

Designations: Model #30
Features: Adaptable to both high and low pressures, this seal is so designed that the number of cylindrical inserts required to maintain

perfect face sealing pressure is determined by the size of the seal. Although there is no limit to the size seal available, these magnetic seals are very compact and require less axial space than spring-loaded seals. By providing balanced pressure, the seal eliminates warpage on the face sealing surface.

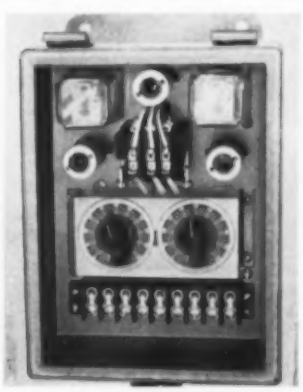
Magnetic Seal Corp.
Barrington, R.I.

Circle 216 on Reader Service Card

ELECTRONIC TIMER

. . . has ±1 percent accuracy

Designation: Model T 3
Features: Timer has independently adjustable on the off ranges. DPDT load contacts are rated at 20 amps., 115 VAC, non-inductive



load. Circuit employs cold cathode tubes requiring no warm-up time before us. Accuracy is ±1 percent and independent of line voltage fluctuations.
Specifications: Standard available ranges are from 0.3—25 sec. per section and 0.5—50 sec. per section, with other combinations available. Dials and controls are removable for remote operation.
Applications: For use on test equipment, proportioning controls and machine applications requiring on-off timing cycles.

Ferrara, Inc.
Oak Park, Mich.

Circle 217 on Reader Service Card

AIR AND HYDRAULIC VALVES

. . . for manual operation

Designation: CRV Series
Features: Two new 3 and 4 way lever-operated valves have been added to this series. Rectangular

body design provides flat surfaces on all sides for easy compact mounting. Easy access to ports simplifies piping. Design incorporates a single sliding spool, with standard easily replaced O-ring seals throughout. Body is of aluminum with brass spool, for complete corrosion resistance.
Specifications: Designed for working pressures to 200 psi. Valve body is ¾ inch thick, 1½ inches wide and 3 13/16 inches long overall on 3-way valves and 4⅜ inches on 4-way valves. In addition to the hand lever type, they are available in palm button, foot lever, roller, cam or pilot-operated valves.

Modernair Corporation
San Leandro, Calif.

Circle 218 on Reader Service Card

VARIABLE SPEED PULLEY

. . . for limited space applications

Designation: E-1350
Features: This ¼ hp pulley can be mounted with the belt take-off close to the motor and/or reversed,

in which case the belt take-off is in an overhung position away from the motor. Made from fine grained castings, the pulley is carefully machined for balance and fit. The outer sheave is keyed to the inner shaft with a heavy duty key and held in position by a special screw. This unit delivers speed ratios up to 2 to 1. Maximum bore is ⅜ inch with keyway. Overall dimensions are 3 5/16 inches long, 3 inches in diameter, and weighs 26 ounces.

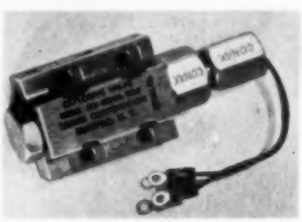
Lovejoy Flexible Coupling Co.
Chicago, Illinois

Circle 219 on Reader Service Card

SHUT-OFF VALVE

. . . operates by firing explosive squib

Designation: Conax Explosive Valve
Features: Compact, light-weight, normally closed valve operates instantaneously by firing a small completely contained explosive squib. Flow passage is closed off by a



solid, integral diaphragm between inlet and outlet ports inside the valve body. Upon firing an unobstructed flow passage from inlet to outlet ports with an equivalent orifice of 9/32 inch diameter is opened in .002 seconds. Only ½ ampere electrical current is required to fire the explosive squib.

Specifications: Units are made entirely from stainless steel or aluminum and stainless steel with AN plug, pigtails or terminal ends electrical connections. Smallest valve weighs only 5 ounces. Maximum operating pressure is 5000 psi, and proof pressure 10,000 psi.

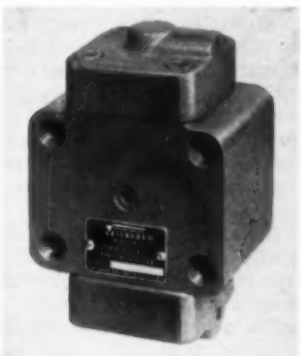
Applications: For use in aviation industry.

Conax Corporation
Buffalo, New York

Circle 220 on Reader Service Card

CHECK VALVE

. . . has 8 gpm capacity



Designation: Model 4CG-03

Features: Gasket-mounted pilot-operated check valve is of spring-closed poppet type construction. Spring closure design provides uniformly consistent operation regardless of valve mounting position. These valves can be arranged in control systems to block flow in a given direction until opened by remotely applied pilot pressure and to allow free reverse flow.

Specifications: For use with ⅜ inch piping in industrial oil hydraulic systems with operating pressures up to 2000 psi. Valves require pilot pressure greater than 40 percent of the system pressure to open. Units are available with either 30, 75 or 150 psi cracking pressure.

Vickers Incorporated
Detroit, Michigan

Circle 221 on Reader Service Card

HIGH PRESSURE VALVE

. . . with micrometer stem

Designation: Micro-Valve

Features: For bleeding and metering pressure letdown control, this valve permits true micrometer control of all types of testing through the principle of differential screw threads. Slightest turn of the handle makes dial settings easy to read.

Specifications: Made in all types of materials including stainless

steel, hastalloy and titanium for vacuum pressures up to 60,000 psi. Available in a complete range of tubing sizes up to and including 9/16 inch.

Applications: For high pressure testing.

High Pressure Equipment Co.
Erie, Pennsylvania

Circle 222 on Reader Service Card

LOOK TO CIRCLE SEAL FOR DEPENDABILITY

• CHECK
• RELIEF
• SHUT-OFF

LEAK PROOF VALVES

T-900 Series . . . Toggle Operated Shut-off Valve . . . Quick acting toggle lever operation with positive leak-proof shut-off. Fool proof, maintenance free, with no adjustments required. Snap it's open . . . snap it's closed . . . dead tight. For liquid or gas—for any pressure up to 3000 PSI. Operates smoothly and easily up to full rated capacity.

Representatives in Principal Cities
SEND FOR INFORMATION

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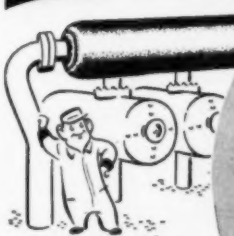
Circle 95 on Reader Service Card

STOP THAT NOISE!

— from intake and exhaust of air, steam and other gases discharged from engines, blowers, compressors, vacuum pumps, steam or gas turbines. Burgess-Manning Snubbers are engineered to your requirements for *quiet operation* and *greater efficiency*. Available with added features for spark arresting—air cleaning—water separating — heat recovery — or surge control.

Ask for literature.

with **BURGESS-MANNING SNUBBERS**



STOP THAT PULSATION!

Drop pipe-line maintenance and service costs sharply — improve flow control and operating efficiency of your equipment by eliminating vibration caused by line surges from compressors, pumps and blowers. In new layouts eliminate cost of special and extra heavy supports to secure piping from vibration.

Write for Burgess-Manning Pulsation Snubber literature.

BURGESS-MANNING COMPANY
Sound Engineering 769 East Park Avenue, Libertyville, Illinois
Dallas, Texas

Circle 31 on Reader Service Card

Circle 132 on Reader Service Card

HAND HYDRAULIC PUMP

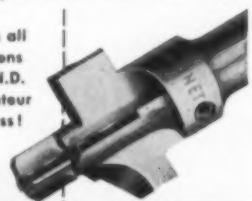
Single and Double Designs
to 20,000 PSI
With or Without Reservoir
Standard Reservoirs
70- 160- 910-Cu. In. Capacity
Interchangeable Pistons
⅜ - ½ - ¾ Inch
1-inch Piston (Special)
Pipe connections ¼" N.P.T.
Handle length is 18 inches.

"We specialize in hand pump units to operate in temperatures from minus 65 F to plus 160 F and with any capacity reservoirs required."
The single pump with ½" or ¾" piston now available in stainless steel.

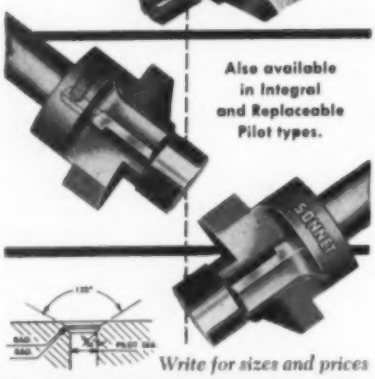
WILLIAM S. PINE
1635 E. 22nd St., Los Angeles 11, Calif.

Sonnet A.N.D. 10050 Port Contour Cutter
now available in a NEW Replaceable Reamer Type

Completes all 5 operations of the A.N.D. 10050 contour in one pass!



Also available in Integral and Replaceable Pilot types.



Write for sizes and prices

SONNET TOOL and MFG. CO.
571 No. Prairie Avenue • Hawthorne, California

Useful Literature continued

SOLVING HEAT PROBLEMS . . . 8 page Bulletin 90030 titled "Heat—Its Generation and Natural Dissipation in Hydraulic Circuits" by J. K. Douglas, development engineer, The Oilgear Company, features useful information regarding: heat transfer area, oil circulation rate, auxiliary pumps, power pumps and pipes and valves. Charted test results that should be of assistance in the engineering, installation and operation of fluid power in industry are included. One chart shows the surface area required to dissipate 1 hp of heat energy for various temperatures. Two charts show heat generated by various sizes of auxiliary pumps and power pumps. Another chart shows amount of heat generated in pipes.

Circle 248 on Reader Service Card

AIR COMPRESSORS . . . of ¼ through 20 hp. are described in comprehensive Catalog No. 36, a 44-page book available from The Brunner Mfg. Co. This literature is designed as a text and guide for those interested in air compressors and includes a detailed engineering section, featuring comprehensive selection information, and tables of computations in installing air compressors. In addition to the engineering section, the catalog contains descriptions, specifications, dimensions, engineering drawings, and representative photographs of the complete line of single and two-stage outfits, both horizontal and vertical; single and two-stage simple compressors, base-mounted power plants and gas engine driven outfits.

Circle 249 on Reader Service Card

HOSE . . . and fittings manufactured by Aeroquip Corp. are detailed in Catalog No. 100 from the company. The catalog covers hose assemblies, fittings, self-sealing couplings, accessories, and includes a section of engineering data. Methods of assembling hose lines are attractively illustrated, and step procedures are given. Accessory equipment such as a hose cut-off machine, hose line assembly machine, and oscilloscope for analyzing pressure phenomena are included. The engineering section gives information on proper hose installation, graphs of bend radius vs. operating pressure, and tables of line support clamp sizes for use with hose.

Circle 250 on Reader Service Card

VALVES . . . for industrial, aviation, and chemical applications are the subject of a new catalog from Republic Manufacturing Co. The 64-page catalog No. 654, covers needle, globe, plug, check, relief, selector, aviation, and special valves. In addition to specifications covering materials, finish, dimensions, proof pressures, etc. graphs are included to show pressure drop as a function of flow. Cutaway drawings are shown for the different valve types, and complete selection and application data is included. Many special units are shown including a high pressure hydraulic relief valve adjustable between 0 and 2500 psi and a manifold unit which combines a needle valve, two check valves, and a relief valve.

Circle 251 on Reader Service Card

FLUID MOTORS . . . of limited rotation are outlined in a brochure issued by Roto-Mation Motors, Inc. These units are available with either a single vane or double vane. In addition to a description of the design and application features of the units, performance graphs showing torque as a function of pressure are included. Mounting data, shaft and styles, and standard accessories are indicated. Four typical applications are shown and other general applications are diagrammed. The motors are built for a pressure of 1500 psi, and can be used with either oil or air. With proper controls the rotative speeds are limited only by the fluid supply volume.

Circle 252 on Reader Service Card

METALLIC O-RINGS . . . for static installations are discussed in Bulletin No. 5491615 available from United Aircraft Products, Inc. The bulletin gives application and selection information for the self-energized devices. Several applications are shown and details of temperature, pressure, fluid, and dimen-

sions are included. The results of tests on the O-rings are presented to indicate the features of this type of packing. Five requirements for a perfect seal with a metallic O-ring are listed and drawings and data are presented to show how each requirement is met. Charts give information on O-ring dimensions, groove dimensions, sizes, wall thickness, material, and compression load required.

Circle 253 on Reader Service Card

SERVO CONTROL VALVE . . . for use in follow-up positioning systems that are mechanically actuated by cams or linkages is the subject of Bulletin CO-5 from Hydraulic Controls Co. Positional feedback can be obtained either by linkages or by mounting the valve directly on the cylinder. The bulletin includes schematics of typical four-way applications. By blocking one cylinder port, it is possible to operate the valve in a 3-way system. The valve is particularly well suited for multiple installations where a number of cams are operated on a single cam shaft. A drawing of the valve is included showing dimensions and giving valve data.

GEAR PUMPS . . . are the subject of Catalog 956 which covers the complete line manufactured by Geo. D. Roper Corp. These pumps which are applicable to many different uses are divided into four series. The H Series pumps are used widely for all types of hydraulic mechanisms, steel mill equipment, and other applications requiring pressures up to 1000 psi. Construction details of the pumps are illustrated and dimensional data is given. Deliveries from 5 to 75 gpm are available in this series.

Circle 254 on Reader Service Card

RELAYS . . . A new line of sectional-pole, heavy-duty, 10-ampere control relays is described in an 8-page bulletin available from Clark Controller Co. Bulletin PL 7305-PM describes the new relays which occupy minimum panel space. The units are available in models with from 2 to 12 poles with models up to 8 poles available without double-decking. Poles are independent units, individually removable without disturbing other poles or wiring. The bulletin illustrates each of the 10 models in the line gives dimensions, enclosures, features, and data on maintenance and pole conversion from normally-open to normally-closed.

Circle 255 on Reader Service Card

HYDRAULIC MOTORS . . . controls, pumps and other products of The New York Air Brake Co. are featured in a new 16-page brochure No. 1102. Illustrated with installation photographs from a wide range of industries, the booklet is intended to serve as a quick and attractive guide to equipment produced by the company. Presentation of each division's products is preceded by a short and informative background section on the development and special features of the equipment.

Circle 256 on Raeder Service Card

GAGES . . . products of The Star-Martin Gage Co., Inc. are detailed in the company's Bulletin No. 30. The bulletin features replacement operating units which can be obtained at about 60% of the cost of a complete gage. Details of dimensions and mounting are presented, as well as ordering information including pressure range, case material, gage connection, temperature, etc. Various styles of dials are shown.

Circle 257 on Reader Service Card

FOR CLEAN, DRY AIR

Distributing Line Of Cool Air From Receiver Tank
Vapor Free Air Near Point Of Use
Take Off From Top Of Pipe
Replaceable Desiccant

MURPHY TRIUMPH AA SEPARATOR-FILTER
Sizes: ¼, ⅜, ½, ¾; Weight 30 lbs; Pressures: 0 to 125 psi; Price: $71.00 ea; Desiccant refills $1.00 ea.

After precooling and separating compressed air, this small unit, placed close to the point of use will finish the job of removing last traces of impurities.

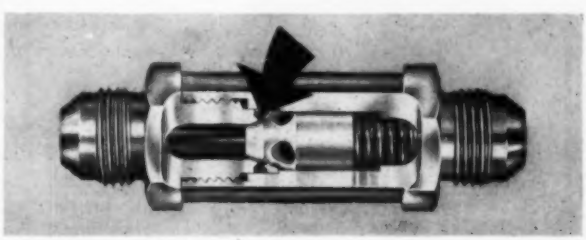
Where very particular work demands dry air completely free from any trace of oil or vapors Murphy Triumph AA is the answer.

AFTERCOOLERS FOR 10 CFM TO 10,000 CFM—SEPARATORS—TRAPS

JAS. A. MURPHY & CO. INC.
Hamilton, Ohio

Circle 184 on Reader Service Card

The **FLEXIBLE SEAL SEAT*** Simple, Secure, Long-Lasting!



Responsive action of the soft O-ring seal provides absolute leak-tightness. Instantly compresses to seal internal and external pressures. Draws harmlessly around dirt particles. No costly precision parts; no extra end seals. Stocked in 6 standard Dryseal pipe and JIC tube sizes; 12 connection combinations. Write for data sheet.

KEPNER PRODUCTS COMPANY
7321 West 59th Street • Summit, Illinois

Kep-O-seal

HYDRAULIC & PNEUMATIC
CHECK VALVES

* PATENT APPLIED FOR

Circle 99 on Reader Service Card

Post Scripts of Industry

News about people, manufacturers and sales organizations

John T. Ellis, Jr.
Hanna Engineering Works

John T. Ellis, Jr., has become chief engineer of **Hanna Engineering Works.** He will be responsible for the engineering activities in product, research and development, methods, industrial and plant maintenance engineering divisions of the company. He was previously on the engineering staff of Underwriters Laboratories.

William E. Muther
The Rucker Company

The Rucker Company announced the appointment of **William E. Muther** to the position of manager of manufacturing and estimating. Prior to joining Rucker, Muther was chief engineer of the Oakland Machine Works. He has had seventeen years experience in the design and manufacture of special hydraulic and pneumatic machinery.

Evan L. Price Company has become the New York representative for the **Sealol Corporation.** The company will cover New York City, Long Island, southeastern New York and northern New Jersey.

Merrill A. Hayden
Waterbury Tool

Merrill A. Hayden has succeeded Warren E. Rouse as general manager of **Waterbury Tool, Division of Vickers, Inc.** Hayden, who joined the Vickers organization in 1935 came to Waterbury Tool in 1950 and has been assistant general manager since 1953. Rouse is retiring after 29 years service but has agreed to serve in a consulting capacity.

Eastman Manufacturing Co., celebrated its 40th anniversary and the opening of their new plant at a recently held open house. Walter C. Schuknecht, president; George N. Jageman, vice president; Merlin Brose, treasurer; and W. D. Dalrymple, sales manager, welcomed the many guests who came from all parts of the country. The new, modern, one story plant, located north of Manitowoc, provides 50,000 square feet of space, which is twice the space occupied previously. The new structure has been designed for complete operating efficiency beginning with the entrance of raw materials until it emerges as manufactured products.

Cutter, Wood & Sanderson Co., Cambridge, Mass., have been appointed as industrial distributors by **Barry Controls Incorporated.**

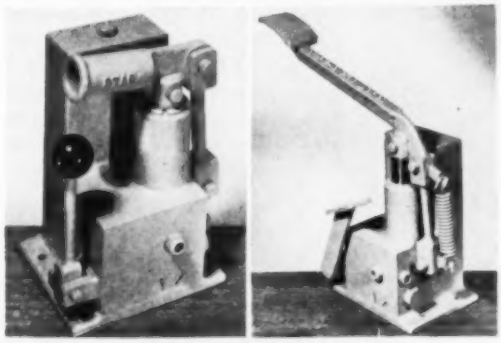
Seymour Blechman has been named executive vice president of **Brooks Rotameter Company.** With over 15 years experience in the field of flow measurement and control, Blechman will be responsible for product improvement and expansion programs.

Commercial Filters Corporation, Melrose, Mass., a wholly owned subsidiary of the Ogden Corporation, New York, has acquired the filter divisions of **Houdaille-Hershey of Indiana,**

Continued on page 218

Circle 155 on Reader Service Card

STAR Hi-Lo TWO SPEED CONCENTRIC PUMPS



HAND OR FOOT OPERATED WITH SINGLE LEVER OR PEDAL

Two speed construction provides automatic change-over during operating cycle from high speed low pressure to low speed high pressure.

MAXIMUM CAPACITY 10,000 P.S.I.

Safety overload valves—Hard chrome plated pistons—Piston stroke 1½ inch—Oil capacity 150 cu in or larger—5 models: (½"-⅞"), (½"-1¼"), (½"-1½"), (⅞"-1½"), (½"-2¼").

Special engineering counsel and proposals cheerfully submitted on request. Ask for Catalog #555.

Representative areas available

STAR JACK CO., INC.
420 LEXINGTON AVENUE, NEW YORK 17
PLANT: RIVER GROVE, ILLINOIS

NEW POCKET MANUAL OF ARC WELDING

AT A NEW LOW PRICE

For Welding Supervisors and Foremen:

Latest welding application data. Revised, pocket-size manual is a concise source of information for those responsible for maintenance and production welding operations.

For Operators and Inspectors:

An easy-to-read reference book that provides practical on-the-spot answers to many arc welding problems—172 pages of necessary working information that can be used in everyday shop work.

The Industrial Publishing Group
1240 Ontario Street, Dept. AH
Cleveland 13, Ohio

Please send me —— copies of the POCKET MANUAL OF ARC WELDING at $1.00 each.

Check or money order is attached

NAME .....

ADDRESS .....

CITY AND STATE .....

ELECTRO SNAP ONE-WAY IMPULSE SWITCH

with exclusive advantages for automation

$10.50 plus $.25 shipping charge

Model ES4-KM2
½ actual size

ELIMINATES INTERLOCKING SWITCHES AND COMPLICATED ACTUATING DOGS

Ideal for pulsing solenoid valves on air-hydraulic controls, sequencing circuits, etc., because it allows other controls to reverse or operate the same circuit. Switch sends a short electrical impulse and then switches itself out of the circuit.

GIVES MORE DEPENDABLE CONTROL

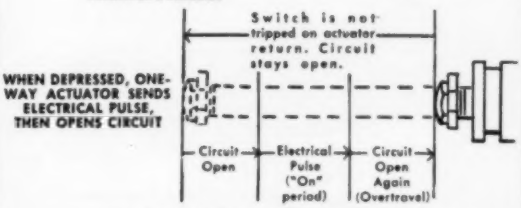
Switch replaces timers, relays, and troublesome one-way dogs to simplify circuits — cuts chances for failure. No delicate adjustments.

LOWERS COST OF CONTROL CIRCUITS

Impulse switch costs less than complicated control devices it replaces. Fewer switches are required for sequencing. Simple mounting.

SPEEDS UP AUTOMATIC OPERATION

Automatic machines can run faster because cycles can be more closely sequenced. There's no delay due to timer tolerances or extra machine motions to actuate interlock switches.


Switch is not tripped on actuator return. Circuit stays open.
WHEN DEPRESSED, ONE-WAY ACTUATOR SENDS ELECTRICAL PULSE, THEN OPENS CIRCUIT
Circuit Open
Electrical Pulse ("On" period)
Circuit Open Again (Overtravel)

SPECIFICATIONS

UL rated at 10 amps/125v AC Movement Dif. 0.020"
Operating Force 3½ lbs.

Model No.	Overtravel	"On" Period (inches of actuator travel)
ES4-KM1	3/8"	1/16"
ES4-KM2	5/16"	1/8"
ES4-KM3	1/4"	3/16"
ES4-KM6	1/16"	3/8"

TRY ON YOUR CONTROL JOB — ORDER NOW
Send Your Standard Purchase Order
Specify Model Wanted—Discounts on Quantity Purchases

ELECTRO-SNAP SWITCH & MFG. COMPANY
4224 West Lake Street, Chicago 24, Illinois

Circle 60 on Reader Service Card

Post Scripts of Industry

continued

Inc. (formerly Honan-Crane), and **Lebanon & Michiana Products Corporation.** The merger of these companies permits the production of a complete line of filtration equipment.

C. T. Erickson has become executive vice president of **Stillman Rubber Co.** He was previously sales manager. Other officers re-elected were: **Harold W. Sears,** president; **Harry Franklin,** vice president and general manager; **George W. Van Cleve,** vice president—sales; **Harvey Morrison,** vice president—production; **Philip B. Keller,** vice-president—engineering; and **Joseph Carol,** secretary-treasurer. It was also announced the **Greene Rubber Co.,** Cambridge, Mass., and **Manufactured Rubber Products Co.,** Philadelphia, Pa., have become franchised Stillman distributors. Greene will cover the states of Massachusetts, Rhode Island, Vermont, Maine, New Hampshire and parts of Connecticut, and the other firm will cover Pennsylvania, Delaware, Maryland and Camden, N. J.

C. T. Erickson
Stillman Rubber Co.

Donald R. Spotz, who has been directly associated with the design, manufacture, and sale of aircraft and industrial accessories, has been appointed general sales manager of the **Pesco Products Division of Borg-Warner Corp.** He will be responsible for the sale of hydraulic pumps, fuel pumps, electric motors and axial flow blowers. **H. Charles Yaeger** was named manager of manufacturing.

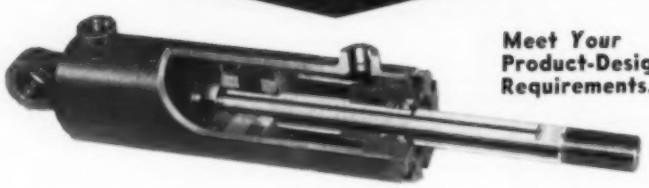
Snap-Tite, Inc., announced the appointment of **George F. Hagger** as director of engineering. A graduate of the University of Minnesota, Hagger has been associated with Chance-Vought Aircraft and with Boeing Airplane Company.

George F. Hagger
Snap-Tite, Inc.

Acro Manufacturing Company has named **Douglas McIlvaine** to the newly created post of director of research and development. He was previously manager of research and development for Soreng Products.

Parker Appliance Company has announced these new distributors: **Metal Goods Corp.,** Memphis, Tenn., for tube fittings and tube-working tools. **Industrial Piping Supply Corp.,** Bessemer, Alabama, for re-usable fittings and hydraulic hose. **Metal Goods Corp.,** Kansas City, Mo., re-usable fittings and hydraulic hose. **Louis H. Hein Co.,** Jersey City, New Jersey, for tube and hose fittings and tube working tools. **Specialties, Inc.,** Alexandria, Virginia, for synthetic rubber O-rings.

HYDRAULIC CYLINDERS
CUSTOM-DESIGNED
by B.H.E.W.



Meet Your Product-Design Requirements.

Dependable performance in minimum mounting space is characteristic of B H E W hydraulic cylinders. Standard and special O.E.M. designs of all types, sizes and any mounting style are available on order . . . delivered on schedule.

Send specifications of your requirements for ANY kind of hydraulic, pneumatic and water cylinder.

BHEW

Lift trucks need the B H E W Pressure-Operated Hydraulic Flow Control Valve. It eliminates surge as load starts down. Load-weight controls rate of descent.

Benton Harbor Engineering Works, Inc.

St. Joseph, Michigan

Weston Hydraulics, Ltd., a subsidiary of Borg Warner Corporation, named **Fred O. Hosterman,** formerly chief sales engineer, to vice president in charge of sales, and **Harvey F. Gerwig,** formerly chief design engineer, to vice president in charge of engineering.

Fred O. Hosterman
Weston Hydraulics Ltd.

A. J. Williamson, vice president, **Tube Reducing Corp.,** announced the organization of the sales department into three divisions: **Specialty Tube Sales Division. C. L. Megargle,** assistant sales manager will also be manager of this new division. **Byron C. Hague** will manage the **Bearing Tube Sales Division;** and **T. L. Lee** was named manager of the **Rockdrawn Tube Sales Division.**

A. L. Caney
Tuthill Pump Company

A. L. Caney was appointed general sales manager of **Tuthill Pump Company.** Prior to joining Tuthill, Caney was midwest district representative for Diamond Chain Company.

Continued on next page

R/M FABRIC PISTON CUPS MEET ALL 5 OF YOUR REQUIREMENTS

The general outward appearance of R/M Fabric Piston Cups—clear definition of contours, smooth surfaces, clean trimming—is evidence in plenty of top-flight precision molding practice. Accurate, carefully controlled, this assures dimensional uniformity and therefore maximum sealing effectiveness.

Cut an R/M Fabric Piston Cup apart and you will see the purpose for R/M's special impregnation method — deeper, more thorough penetration of the compound into the fabric. This keeps wicking action from destroying the cup internally. It also builds up greater resistance to ply delamination.

R/M Fabric Piston Cups are thoroughly inspected, hardness is consistent, and they adhere strictly to industry standard sizes. To meet your requirements, R/M engineers will recommend the proper combination of asbestos or other strength member with rubber-like synthetic composition to best meet temperature and pressure conditions.

R/M MAKES A COMPLETE LINE OF MECHANICAL PACKINGS

R/M's line of molded hydraulic and pneumatic packings includes:

VEE-FLEX PACKINGS
VEE-SQUARE PACKINGS
HOMOGENEOUS VEE-RINGS
FABRIC PISTON CUPS

For complete information, send for booklet

R/M PACKINGS
RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, PASSAIC, N.J.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Packings • Asbestos Textiles • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Laundry Pads and Covers • Bowling Balls

Circle 138 on Reader Service Card

Post Scripts of Industry
continued

Marvel Engineering Company have moved into their new modern plant at 7227 N. Hamlin Avenue, Chicago. Enlarged designing and engineering departments are fully equipped and staffed to facilitate the company's constant research for the improvement of filtration of hydraulic oils and other liquids. Design of the new construction will allow future expansion when necessary.

Twin Disc Clutch Company has appointed **R. A. Harmon** as district sales supervisor. He will be responsible for coordinating geographical marketing and general supervision of the activities of Detroit, Los Angeles, Newark, Cleveland, New Orleans, Rockford and Racine branch sales offices. **W. F. Shurts** has been elected vice president—engineering. He has been with the company since 1940.

L. L. Shaffer
J. N. Fauver Co., Inc.

L. L. Shaffer has been promoted to branch manager in charge of the Cincinnati warehouse and office of the **J. N. Fauver Company, Inc.** This branch serves southern Ohio, Kentucky and southeastern Indiana.

A. J. Allcock, Jr., was appointed chief staff engineer of **Sterling Electric Motors, Inc.** He was previously chief mechanical engineer and was instrumental in the development of many product improvements.

At their recent annual sales meeting, attended by 41 representatives from every part of the country, **Petch Manufacturing Company** announced the appointment of new representatives in Minneapolis and Toledo. **Ringerud Equipment,** Minneapolis and **Midwest Die Supply Company,** Toledo. **Charles Petch,** president, displayed architect's drawings of the new plant which will be completed by the time of the next sales meeting. **W. W. Hutcherson,** sales manager conducted the discussions on the merchandising plans for the new year.

Kewanee-Ross Corporation, a wholly owned subsidiary of American Radiator and Standard Sanitary Corporation, has been dissolved and two new American-Standard divisions formed to continue Kewanee-Ross operations. The two new divisions are the **Kewanee Boiler Division** and the **Ross Heat Exchanger Division,** which will produce Ross heat exchangers, surface condensers and allied products. **John C. Linsenmeyer** was named president of the Ross Heat Exchanger Division and **Richard S. Reade** executive vice president.

R. A. Paulbach was named to the sales management staff of **Resistoflex Corporation's** western division. Paulbach will headquarter at the company's offices and

R. A. Paulbach
Resistoflex Corp.

plant at Burbank, California. He was previously with Aeroquip Corp.

West Coast activities of the **Allen B. Du Mont Laboratories, Inc.,** are now located at 11800 W. Olympic Boulevard, Los Angeles 64, California.

Coming
March 19-23
The best and latest in tools, machines, inspection equipment, automation devices, controls and accessories to cut costs and boost profits—many never before shown anywhere.
• For the small plant
• For the intermediate plant
• For the big plant
1956 ASTE
INDUSTRIAL
EXPOSITION
INTERNATIONAL AMPHITHEATRE
CHICAGO, ILL.
AMERICAN SOCIETY OF
TOOL ENGINEERS

Don Gibbons was made division manager for Chicago and northern Illinois for **The Aro Equipment Corporation.** He

Don Gibbons
The Aro Equipment Corp.

will headquarter in the company's new branch office located at 4752 West Washington Blvd., Chicago.

Le Roi Division of the Westinghouse Air Brake Co., has opened its new headquarters for the southwestern sales region at 5000—45th West Avenue, Tulsa, Oklahoma. Located on a five acre lot the building includes complete modification and assembling facilities, replacement parts store and an extensive warehouse. In addition to servicing, the new plant will have the duties of engineering, fabricating and assembling a complete line of booster compressors and air drilling compressors.

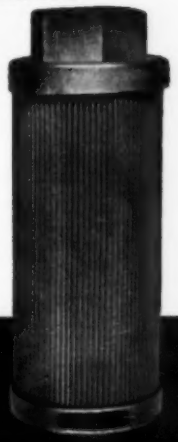
Arthur C. Edwards
Chiksan Company

To provide technical assistance to customers in the field, **Chiksan Company** has promoted **Arthur C. Edwards** to field engineer. Associated with the firm since 1946, Edwards has over fifteen years engineering experience.

Continued on next page

Circle 32 on Reader Service Card

★ONLY THREE PARTS
★MEETS J.I.C. STANDARDS
★GREATER FILTERING AREA
★SPECIAL TRAP-WEAVE MESH



The New
CAPITAL HYDRAULIC OIL FILTER
WITH MONEL METAL INSERT
Reservoir Type for Hydraulic and Oil Re-Circulating Machinery
EASY TO INSTALL • EASY TO CLEAN • LONG LIFE • LOW COST
SIZES AND SCREENS TO FIT YOUR NEEDS

CAPITAL ENGINEERING & MFG. CORP.
5837 South Ashland Avenue Chicago 36, Illinois

SEND your specifications for hydraulic cylinders to American, specialists in hollow boring and honing. We manufacture from tubing or forgings in carbon or alloy steels up to 15" I.D. Over 40 years experience backed by precision machines and skilled craftsmen will save you time and money. Send your blueprints.

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AMERICAN HOLLOW BORING COMPANY
1934 RASPBERRY STREET • ERIE, PA.

SPECIALISTS IN THE MANUFACTURE OF HYDRAULIC CYLINDERS

Circle 14 on Reader Service Card

Post Scripts of Industry
continued

Minnesota Rubber & Gasket Company's St. Louis district office has moved to larger quarters at 8131 Manchester Blvd., Brentwood, Missouri.

The following organizational changes have been made by **Aeroquip Corporation: Kent R. Manning,** formerly manufacturing manager at Aeroquip, has been named general manager of the Jackson Division, **George Lagassa,** former production control manager was named plant manager of Elbeeco, Inc., **Dan Ruple** has become production control manager of the Jackson Division; and **Wayne G. English** is the new treasurer succeeding H. L. Schrock, Jr.

EXPANSION AT VICKERS INC.

PROVIDES EXCEPTIONAL OPPORTUNITIES FOR

Hydraulic, Mechanical & Electronic Engineers

HYDRAULICS INDUSTRY GROWTH POTENTIAL
Indicative of the continuing rapid rate of growth of the hydraulics industry is Vickers need for the new 150,000 sq ft research, engineering and administrative building shown above. No manufacturing will be done here.

DESIGN ENGINEERS
Experienced product designers and recent graduates with degrees in Mechanical, Aeronautical or Electrical Engineering.

RESEARCH AND DEVELOPMENT ENGINEERS
Experienced theoretical and laboratory engineers (mechanical and electronic) and physicists.

TECHNICAL SALES ENGINEERS
Experienced Mechanical or Electrical Engineers who have sales ability and are willing to relocate after training. Excellent opportunities also for recent graduates to train for hydraulics sales.

PRINCIPAL FIELDS OF APPLICATION FOR VICKERS HYDRAULICS

AIRBORNE
Missile controls, jet engine controls, constant speed drives, servo-mechanisms, valves and complete aircraft hydraulic systems.

AUTOMOTIVE
Power steering and other hydraulic systems and accessories for passenger cars and light trucks.

MOBILE EQUIPMENT
Agriculture, construction, earth moving and materials handling hydraulic units and complete systems.

INDUSTRIAL MACHINERY
Components and complete systems for automation, numerical control, machine tools, mining, textile, lumber, etc.

FEDERAL AND MARINE
Army ordnance, atomic energy, marine and naval vessel components and complete systems.

• • • •

These are really exceptional opportunities to grow with a rapidly expanding company. Mail resume of education, experience and personal qualifications to

Salaried Personnel Dept.
Section 1155
VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
1400 OAKMAN BLVD. • DETROIT 32, MICH.

VICKERS®
THE LEADING NAME IN
HYDRAULIC SYSTEMS

7378

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Promotion of **Jesse A. MacIntire, Jr.,** to manager, Wire Braid Hose Sales for the **Republic Rubber Division, Lee Rubber and Tire Corporation,** has been announced. He was previously Chicago district manager and will be succeeded in that position by **Irving G. Wollter.** Both men have wide experience in industrial rubber products.

Jesse A. MacIntire, Jr.
Republic Rubber Division

Bendix Aviation Corporation has established a new market research and development department. According to Malcolm P. Ferguson, president, the organization of this department was necessitated by the increased activity in the development of new products. **Crockett A. Harrison,** a graduate of M.I.T. and associated with the aviation field for 28 years, has been named to head this new department. The company's engineering staff includes more than 3000 persons.

Superior Tube Company has assigned George Krauss, Jr. to the metallurgical laboratory of its technical division and **Rodney G. Utter** has joined the mechanical development division.

The Industrial Actuators and Controls Division of National Pneumatic Co., Inc., appointed **Air Engineering Company,** 1105 Cathedral Street, Baltimore, Md., as exclusive distributor for the state.

Harry Stott has been named as general sales manager for **U.S. Gasket • Belmont Packing.**

THE MARKET PLACE

SENIOR HYDRAULICS ENGINEER

Opportunity immediately available in the aircraft landing gear department in company which is a pioneer and leader in aircraft and automotive components. Hydraulics activity: creative design, laboratory testing, production and inspection liason, performance analysis, and test data plotting. Engineer must have a minimum of five years of hydraulic experience, preferably in aircraft, to work with master cylinders, power valves, hydraulic servos and pressure reducers. Northern Indiana. Salary in line with applicable experience. Send resume. Address Box 1156 APPLIED HYDRAULICS.

AVAILABLE: DESIGN AND PROJECT ENGINEER

Capable of taking charge of research and development program of hydraulic components. Ten years experience. Will submit complete resume upon request. Registered professional engineer State of Ohio. Box 1256 APPLIED HYDRAULICS.

SALES ENGINEER—WEST COAST

Expansion creates outstanding territories in Seattle, San Francisco and Los Angeles. We are the exclusive distributors for nationally known top air and hydraulic lines. Large local inventories maintained. Our own top flight engineering department and shops design and build special machinery. Applicants, not over 40, must have technical and sales background in field of applied air and hydraulics for industry. Substantial salary plus commissions and expenses with well developed territory offered. Resumes will be handled in confidence. Local interviews arranged. Write C. J. Woodward, V. P., The Rucker Company, 4700 San Pablo Avenue, Oakland 8, Calif.

SALES ENGINEERS WANTED

Fluid power components distributor seeking two top flight sales engineers. Must show outstanding hydro-pneumatic sales record in North East coastal area. Sound opportunity for really capable man. Write Box 1356, APPLIED HYDRAULICS.

Circle 6 on Reader Service Card

TESTS

AETCO offers unparalleled equipment, skilled engineers and round-the-clock schedules . . . to provide you with every conceivable kind of testing of your products, processes or components.

AETCO maintains high aviation standards in its testing of material for all types of industry. AETCO renders unbiased qualification reports, fully acceptable to governmental and other specifying agencies.

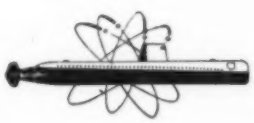
Send for booklet.

AIRCRAFT EQUIPMENT TESTING CO.

1806-12 Fleet Street
Baltimore 31, Maryland
Phone: ORleans 5-8337

MECHANICAL ENGINEERS

What Should an ME Know About Atomics?



Quite a bit these days, with so many companies getting into the field. While many new firms are now starting to explore the field, Electric Boat Division of General Dynamics Corporation led the way with the building of the first nuclear powered submarines, Nautilus and Sea Wolf.

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Men interested in these openings should write complete details of background and experience including initial salary requirements. Interviews will be arranged promptly for qualified applicants. Address Mr. Peter Carpenter.

Electric Boat Division
GENERAL DYNAMICS CORPORATION
GROTON **CONNECTICUT**
near New London on the Connecticut shore

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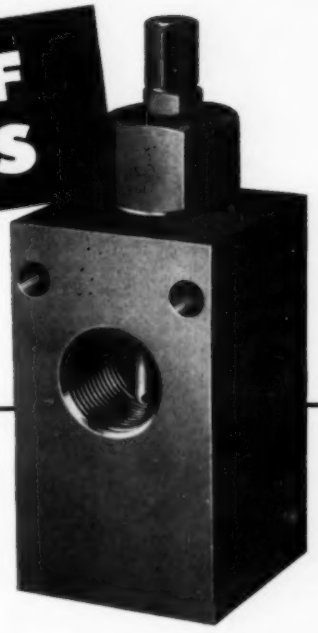

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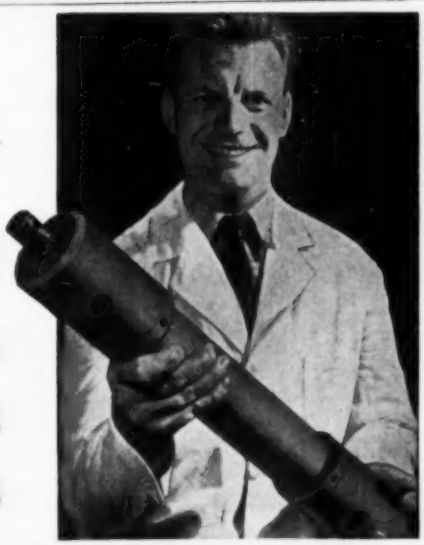

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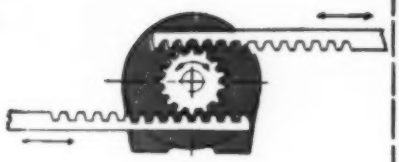

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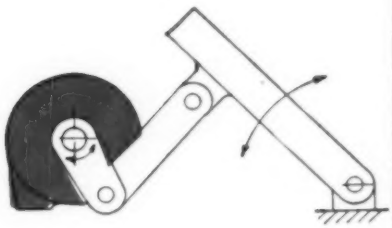
DOUBLE TRAVEL



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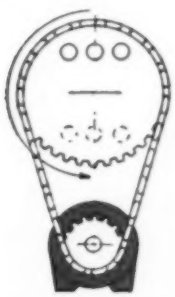

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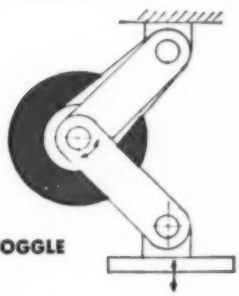

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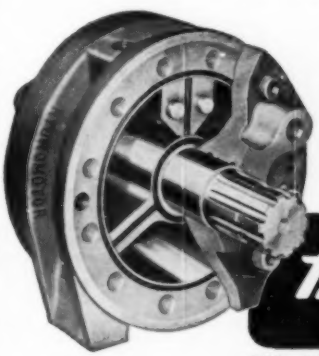

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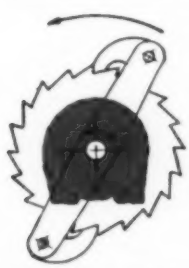

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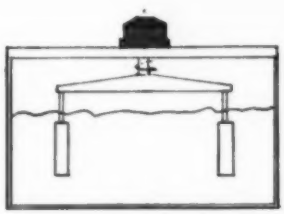

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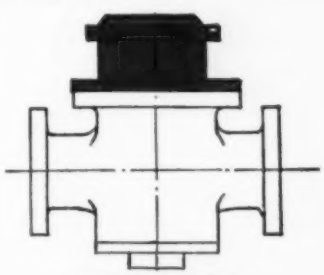

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O.E.M. NEWS

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